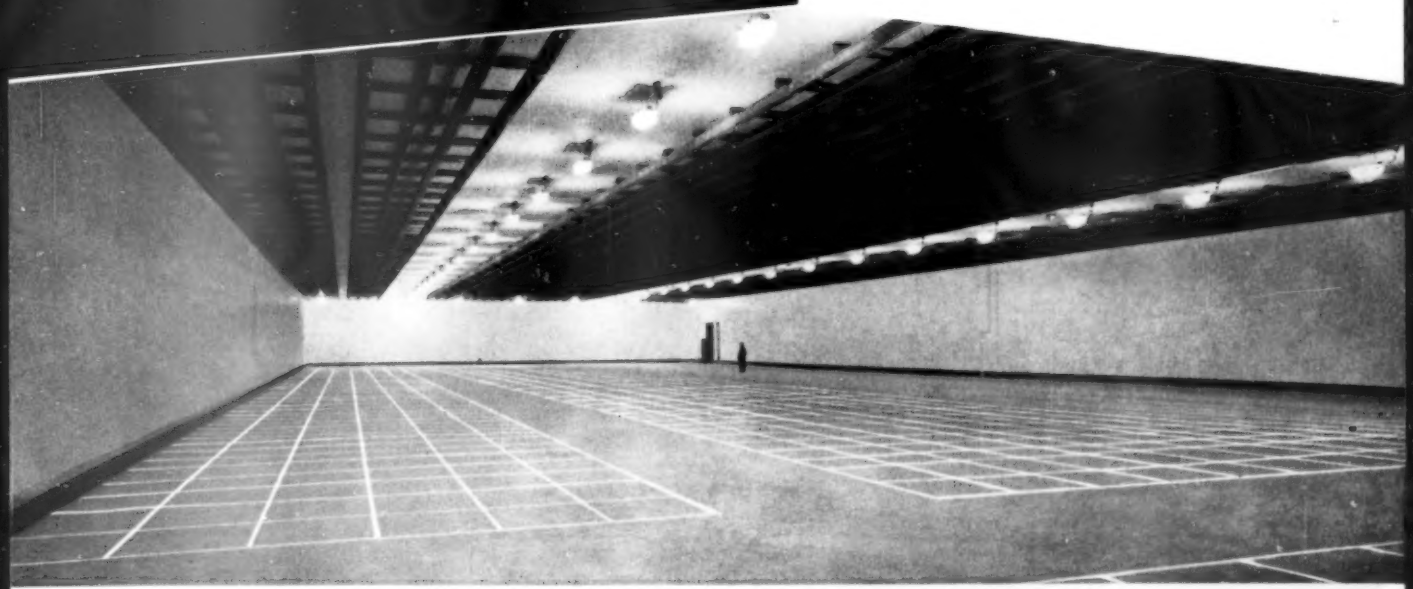
Modern Refrigeration & Air Control

Vol. 62 No. 738 SEPTEMBER, 1959 Price 2s. 6d. monthly



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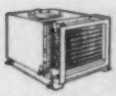

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Central station installations up to 1,000 tons refrig.

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LARGEST PRODUCER OF AIR CONDITIONING UNITS OUTSIDE THE U.S.A.

P.2303

"WE SAID WE'D DO IT— AND WE DID!"

Q. Frigidaire's Five Point Development Programme for Commercial Refrigeration has been in operation now for two years. How is it progressing, Mr. Porter?

A. I'm proud to tell you it's going very well indeed.

Q. How does it directly affect those of us in the Commercial Refrigeration business?

A. In many ways. Let's consider the five points of the Development Programme. No. 1 is Production and Development. No. 2 Sales. No. 3 Sales Service. No. 4 Training and No. 5 Export. Under every heading we have made great strides which will benefit *you*.

Q. Could we take No. 1—Production and Development first, Mr. Porter?

A. In 1957 I said that in three years we planned to expand our production by 50% over the 1956 figures. *Well, we've beaten our own target. We did it in two years!* By June 1959 we had increased the annual output of Commercial Refrigeration equipment by 50.6% over the '56 figures.

Q. And what about Development?

A. Very satisfactory. Between June 1957 and May 1958 we produced *twelve* new commercial products—one a month. That's good going! Then between June 1958 and July 1959 we added nine more. These new products range from Dehumidifiers to self-service display equipment. We have just acquired additional large premises adjoining our plant at Hendon. They will house our new completely integrated research unit and will provide even greater facilities for design and engineering. The most up to date equipment will be installed including a unique electronic control panel for centralised temperature recording. These developments mean a continuing flow of better and lower priced products for you.

Q. Let's take point 2—Sales. How have they gone?

A. Again we have beaten our own target. I said we'd do it and we did. In 1957 we were already the leading manufacturers of refrigerating equipment in Great Britain. Now we have further increased our lead in the industry.

Q. No. 3 Sales Service—are there any new developments?

A. Yes. Frigidaire was the first manufacturer to give a five year warranty on commercial compressor units. Well, *we're now extending the five year warranty to cover the motors as well on all Frigidaire commercial condensing units under 5 horsepower. And*—we're pleased to announce *sweeping price reductions* up to 10% on condensing units and evaporators. We are also reducing prices on our very popular Frozen Food Display Cases. You see how our achievements benefit you in a practical way. We are also continuing and expanding our Self-Service Advisory Bureau, and are arranging Self-Service demonstrations around the country.

Q. This brings us to point No. 4. With production and sales rising are you increasing your Training?

A. You remember I said in 1957 that we hoped to provide a Frigidaire Viso-Trainer free to colleges in the U.K. offering full time courses in Refrigeration. We have done that. Those colleges have already got them. We have stepped up our training of service engineers—over *400* men have been given extra training at the factory in the past two years. And as a further part of our development plans, we have enlarged our Sales and Technical Training Staff, whose job includes the organisation of lecture tours throughout the country. Thus our Sales, Technical and Service staffs will be even better equipped than before to help with your problems.

Q. And how is Frigidaire faring in the Export Market Mr. Porter?

A. In the face of very severe competition we have made progress. We have been particularly successful with our low temperature ice cream conservators and display cases. We've increased exports of these by 51% in the past two years.

Q. Then undoubtedly you feel that, so far, the Five Point Development Programme is a success. What of the future?

A. What I've told you is only the beginning. Every day we are seeing new developments. We are ahead in all aspects of Commercial Refrigeration—*and we shall stay ahead!* Our slogan: "Frigidaire means BUSINESS —for YOU!" is no more than a simple statement of *fact*. All Frigidaire users know that. They know that it's going to mean even better business in the future—for them and for us.

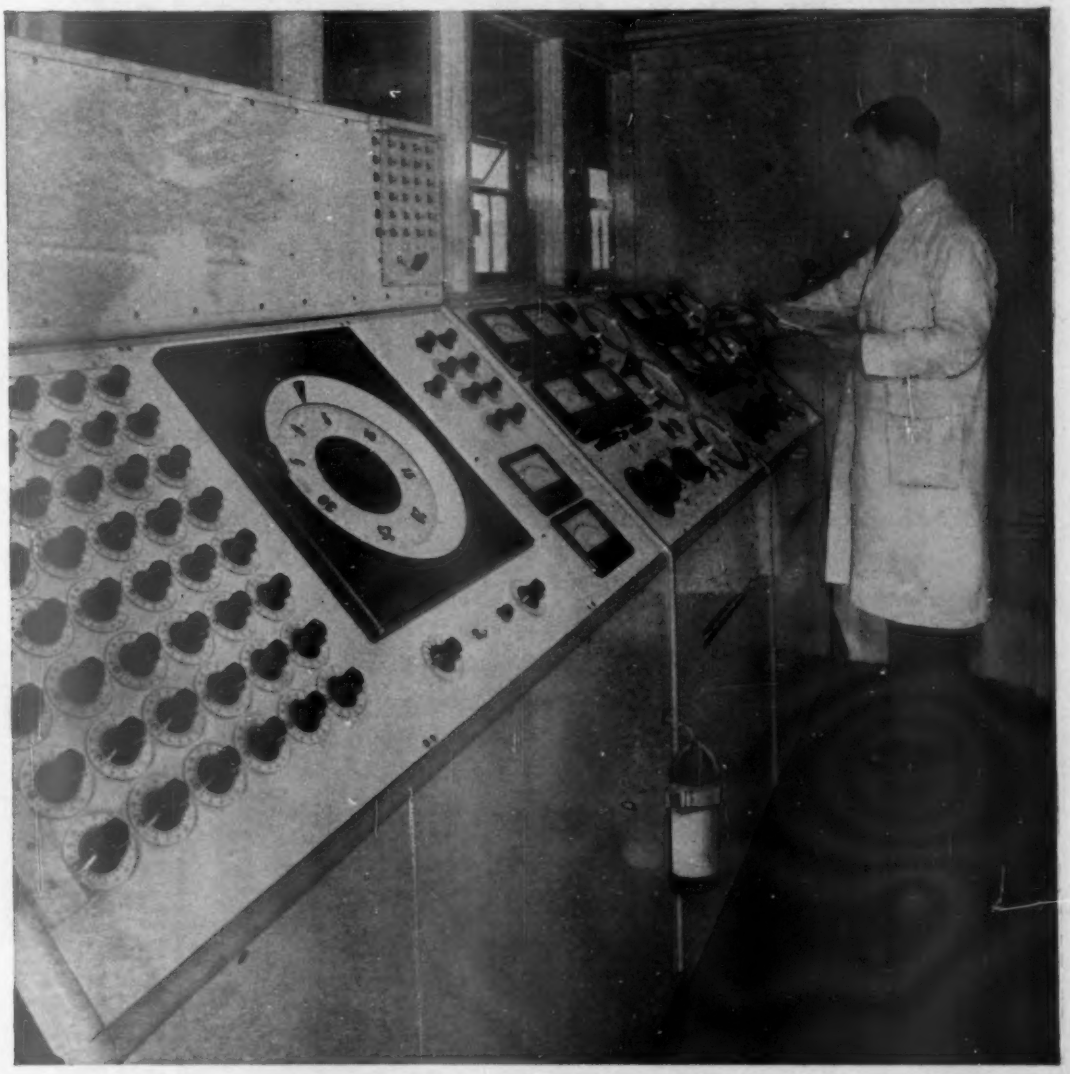
FRIGIDAIRE

REGD. T.M.

FRIGIDAIRE DIVISION OF GENERAL

Frigidaire's General Manager reports to you on the achievements of Frigidaire's "Five Point Development Programme for Commercial Refrigeration"

Another "FIRST" developed by Frigidaire: A unique electronic control panel for centralised temperature recording installed in the new engineering laboratory at the Frigidaire Plant.



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The "MINIVEIL" air curtain permits the cold store door to remain open for prolonged periods, giving completely free passage for men and goods, with a negligible rise in store temperature. This is achieved by a controlled curtain of air over the outside of the door-opening the whole time the insulated door is open.
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This brilliantly designed 13 cu. ft. capacity bottle cooler stores a large number of bottled minerals, beers or fruit juices and has lavish ice-making capacity, yet takes up the minimum of floor space. Fully adjustable shelves get the utmost from every cubic inch of capacity.

EXTERNAL MEASUREMENTS: Height 70½"; Width 30"; Depth 27".

UNIT: Lec hermetically sealed murmur-quiet Vertimetic unit with very low power consumption, guaranteed 5 years.

CABINET: All steel chromate etched primed, finished with 'Lec De Luxe' high-bake synthetic enamel. Warranty, 1 year.

PRICE: £106.10.0

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Please send full details of the Lec Bottle Cooler and other commercial refrigerators.

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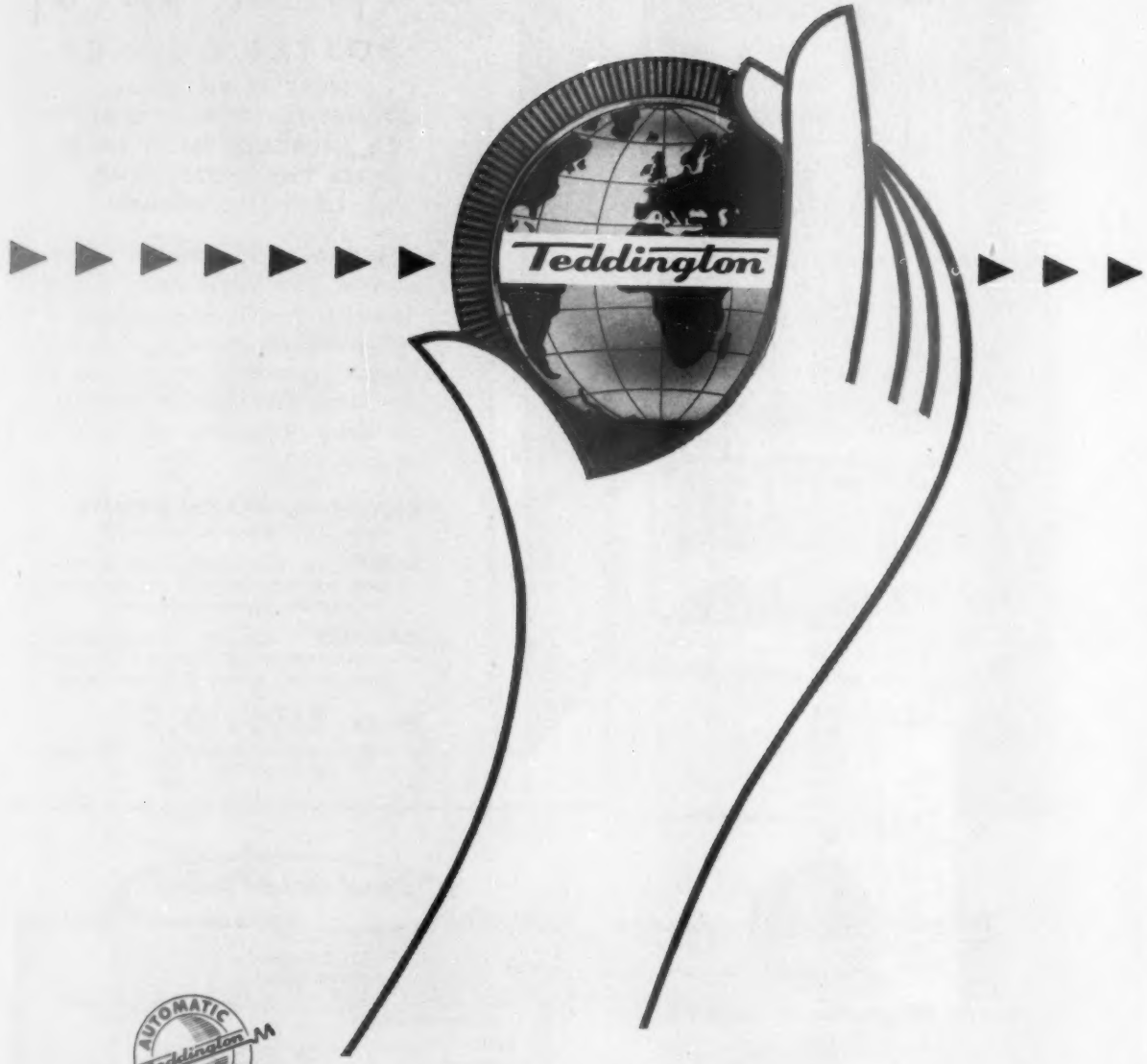
world's best domestic



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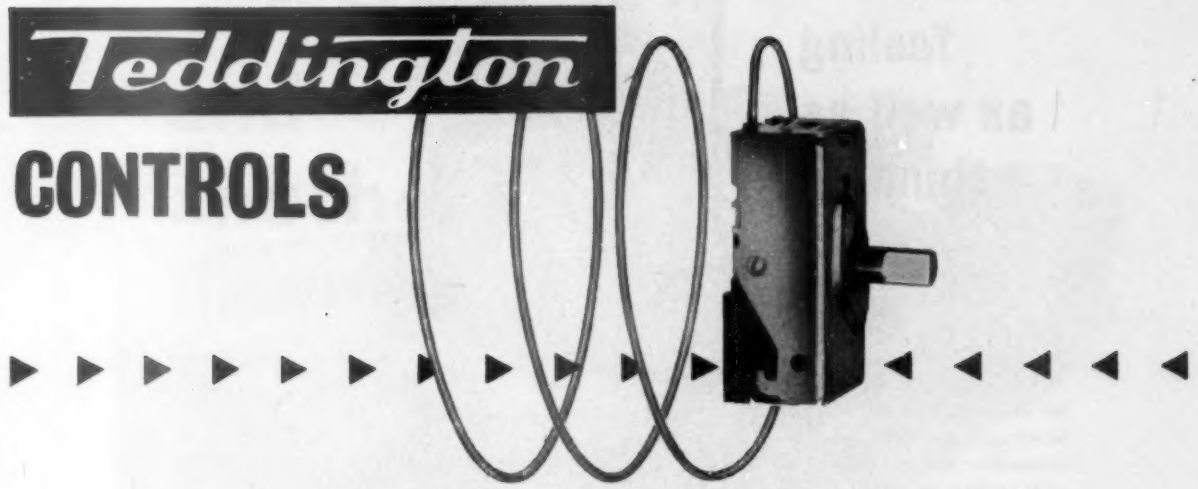

The most reliable, accurate and compact refrigeration Thermostat yet devised.
The New Teddington Thinline Thermostat Type KCA for Absorption or Compressor type Domestic Refrigerators.

The Teddington Thinline Thermostat utilizes a well-tried seamless metallic bellows in conjunction with a heavy duty blade spring for supreme reliability.

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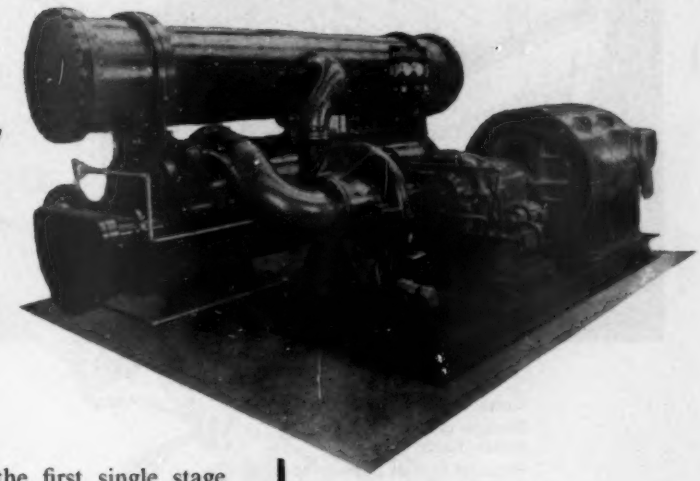
and another first for YORK



What are believed to be the first single stage turbo compressor water chilling systems to be exported from Great Britain to the Middle East left recently for Kuwait Oil Company's new hospital.

Two entirely self-contained turbo packaged water cooling systems were designed, with special consideration given to the problems arising from insufficient fresh water supplies and the necessity of using sea water for cooling. Each system is rated to cool 875 gallons per minute, which represents a heat removal rate of 4.2 million B.Th.U's per hour.

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Produce ticket strip

Formica top with aluminium beaded edge

Embossed evaporator divider plates

Stainless steel defrosting capping

Quadruple glass, clear vision display window

High gloss, hard baked, stove enamel finished with aluminium decorated beading

Gross capacity 15 cubic feet.
Storage capacity 450 lbs. frozen foods.
Finished in high gloss stove enamel with Formica serving shelf and colour mounted aluminium beading.

WHITE

THE 'CARISBROOKE' FROZEN FOOD DISPLAY COUNTER

The ever-increasing demand for quick-frozen foods has prompted the design of this addition to our range of refrigeration products. The glazed window unit permits the display of a wide range of frozen produce, the open top giving unrestricted customer accessibility without disturbing the display. Attractive in appearance and efficient in operation, the Carisbrooke frozen-food display counter is a M-U-S-T for every progressive vendor of frozen foods.

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This little boy is achieving two objects at once, but neither is particularly constructive, and he won't stay in this position very long.

We, on the other hand, can produce pure-bred ideas from a pedigree line of valuable experience, and the result of our efforts will be as permanent as anything man-made can be.

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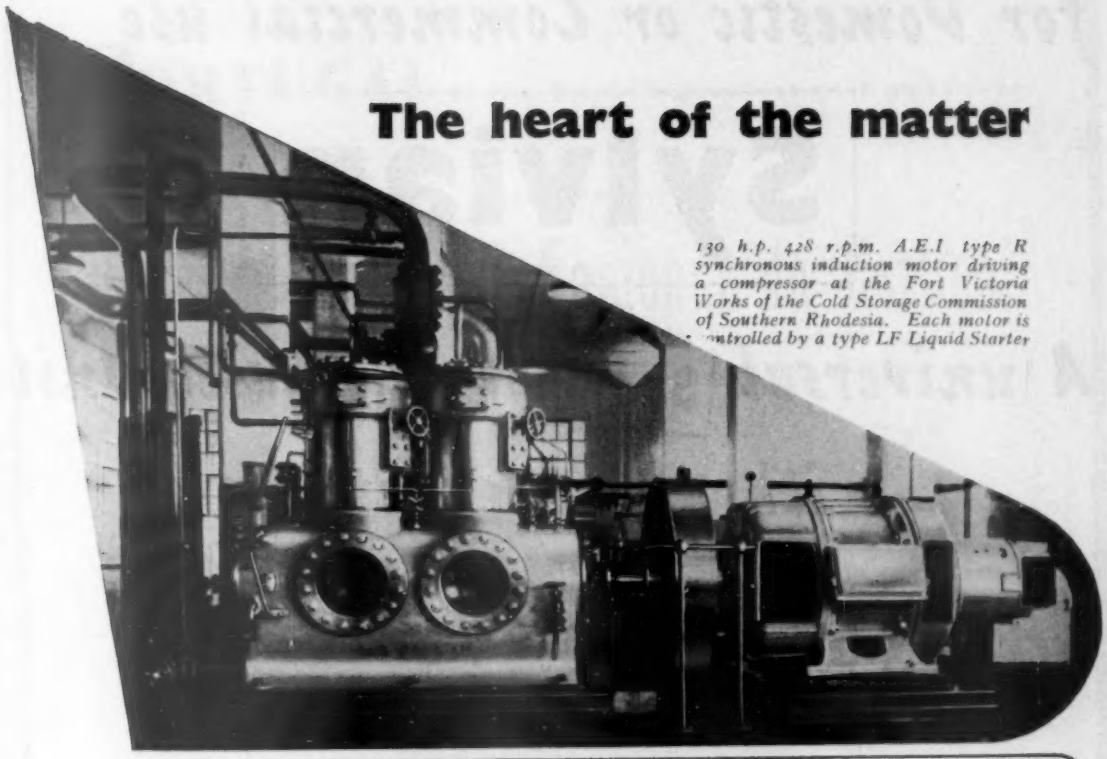
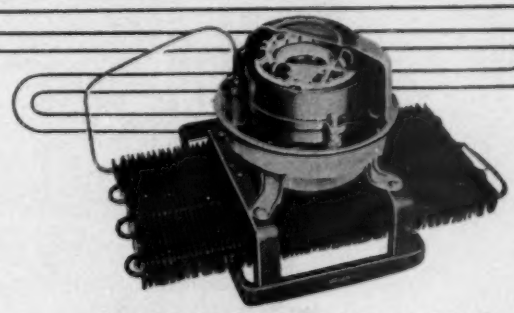
The heart of the matter



130 h.p. 428 r.p.m. A.E.I type R synchronous induction motor driving a compressor at the Fort Victoria Works of the Cold Storage Commission of Southern Rhodesia. Each motor is controlled by a type LF Liquid Starter

In refrigerating plant it's the motor that matters. A.E.I. motors are designed by engineers with first-hand knowledge of the refrigeration industry. They do not stop at B.S. Specifications. Maximum reliability with minimum maintenance is the specification followed. Whatever the size of refrigerating plant, it pays to install one of the range of A.E.I. motors.



An A.E.I. fractional horse power stator and rotor unit sealed into a Lec Refrigeration Ltd. refrigerator compressor.

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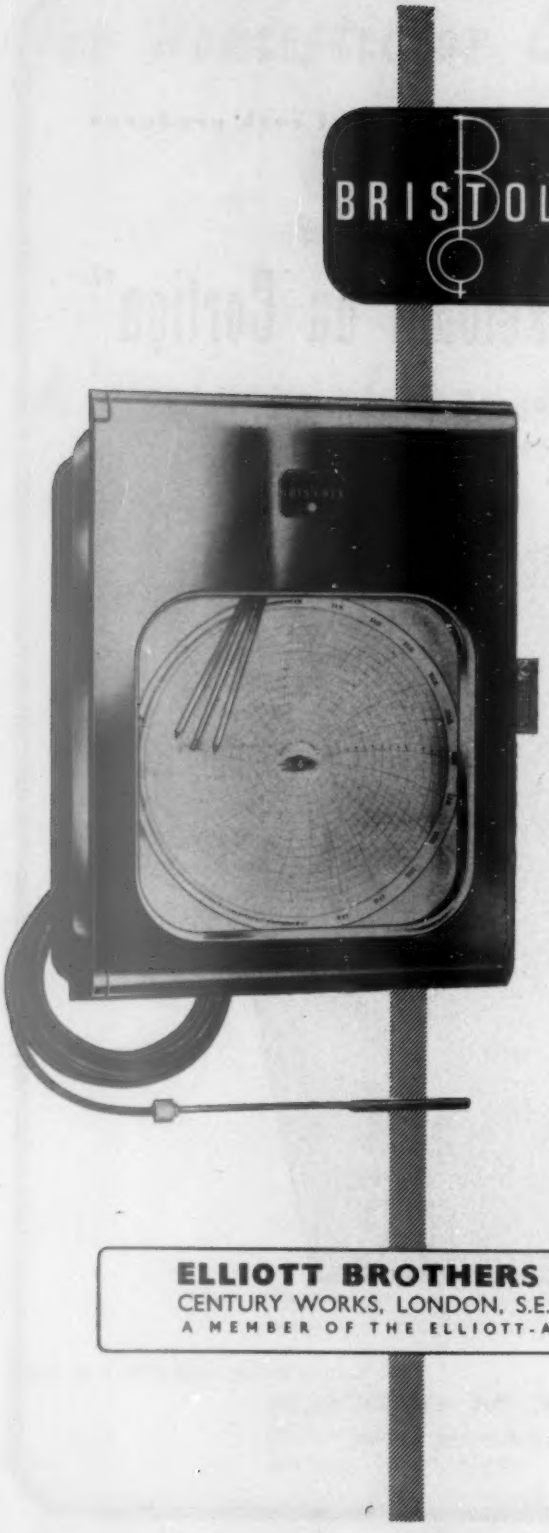
INCORPORATING THE MOTOR & CONTROL GEAR INTERESTS OF BTH & M-V



BLOOD BANK RECORDING THERMOMETERS

"*A blood bank refrigerator, not equipped with a constant recording thermometer, may go off during the night because of power failure. Power is restored, but not until after the blood has become warm. The blood is recooled and the hemolysis that occurs when the red cells are brought to body temperature at the time of transfusion may not be detected unless a sample is centrifuged. Severe hemolytic reactions may therefore result.*"—CARL V. MOORE, M.D., The Journal of the American Medical Association.

Bristol's Blood Bank Recording Thermometers ensure

- PROTECTION AGAINST FREEZING OF BLOOD BANK due to refrigerator thermostat failure.
- A WARNING OF DANGER when the temperature deviates from the safe range.
- AN ACCURATE CHECK ON TEMPERATURES by providing a continuous record of conditions in the blood bank.

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Bextrene's toughness, dimensional stability and chemical resistance make it a first class material for all types of semi-rigid packaging containers; display materials; component parts for radio and television sets; toys and decorative novelties.

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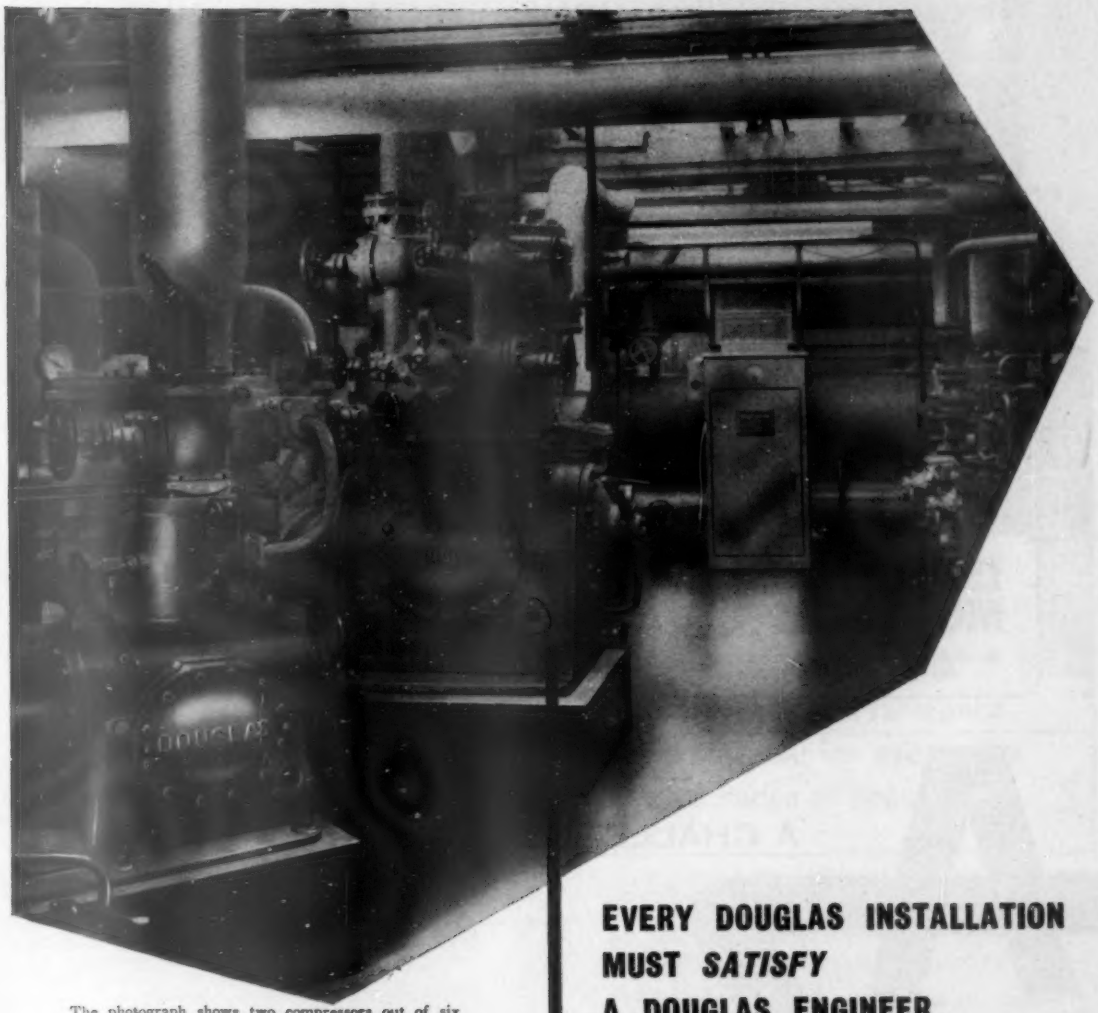

The photograph shows two compressors out of six in a two-stage installation serving a number of ice-cream hardening tunnels. The premises are those of Messrs. Nielsons (Ice Cream & Frozen Foods) Ltd., by whose courtesy this photograph is reproduced.

OTHER DOUGLAS EQUIPMENT COMPRISES:

CONDENSERS shell and tube, or evaporative.
INTERCOOLERS
LIQUID AMMONIA PUMPS
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INSULATION and COLD ROOM DOORS for all cold storage and low temperature applications.

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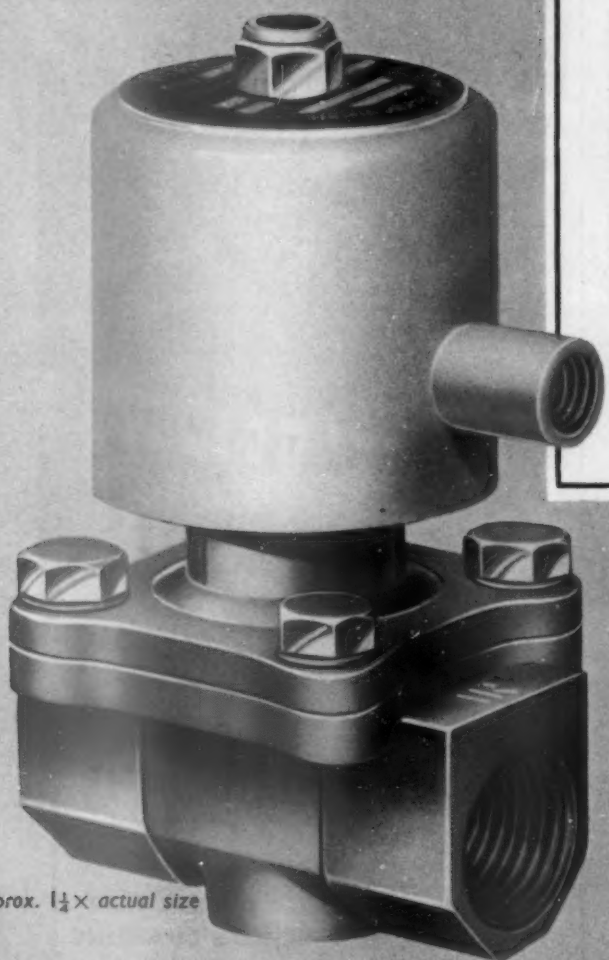
ETHER SOLENOID VALVES

—illustrated is the Type DF high-performance valve suitable for use over a wide range of pressures



Approx. 1½× actual size

One of the outstanding new range of solenoid valves recently introduced by ETHER LTD., the DF is a pilot-operated diaphragm valve. It is designed for use over a wide range of pressures and is particularly suitable for use with the Halogen Refrigerants. It is equally suitable for use with fuel gases, fuel oil, water and compressed air. The standard model has ½" B.S.P. female connections. Non-standard versions can be supplied to order.

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The fact that the first job to be handled by this new EKCO machine should be for the Refrigeration Industry is another indication of the closeness of our association. If you have any plastics problem that this machine might help to solve—or, indeed, *any* plastics problem whatsoever—you have only to call on the long experience of Ekco Engineers.

EKCO **plastics for the Refrigeration Industry**

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HERMETIC SYSTEM BUILDING

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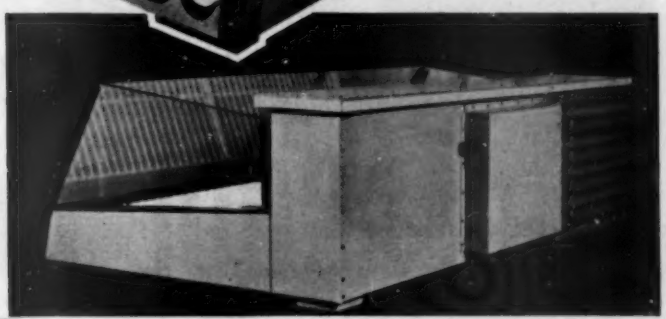
CONNAH'S QUAY 403 (2 lines)

COMPLETE WITH SEALED UNIT !

THE PILOT REFRIGERATED SHOWCASE



SPECIFICATIONS

Sealed Unit. 5-year warranty on Sternetic condensing unit.

Construction. Framework of well-seasoned timber, finished in heavy zinc-plated steel, stoved in colour as required.

Finish. 8 inch Formica serving top, colour as required. Heavily chromed, glass supports. Plastic-covered wire trays and fitted thermometer standard equipment.

Capacity. 4 ft. model. 8 sq. ft. base area giving approximately 6 cu. ft. of refrigerated display.

Duty. Average display temperatures of 36° - 50° are obtained in ambient room temperature of 80°.

For the actual size of the machine, these counters, fitted with sealed unit, offer the greatest refrigerated display and storage space on the market today. Manufactured in 4 ft., 5 ft. and 6 ft. sizes, they can be supplied in any contrasting colour scheme required, at no extra cost. Installation consists of fitting plug top to existing 3 yards of cable only.

The sloping storage base ensures positive refrigeration to all corners of display, while the high glass front gives maximum protection against the accidental ingress of bacteria.

PILOT

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Telephone: Brightlingsea 364

RANCO EXPANSION IS MEASURED IN MILLIONS

The last few years have seen one Ranco development follow rapidly upon another . . . both in products and production. From a small Scottish factory at Newhouse to a large one at Tannochside; the establishment of the Research and Development Laboratory at North Berwick. In Italy the factory of Ranco Italiana is now in full production and in Germany another Ranco factory is starting up. Production of Ranco controls is now well above two million each year and rising steadily to add to the 110 million controls already supplied by the Ranco organisation to the world markets.

New Technical Sales Office Opens: **A new technical sales office has been opened in London:**

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THE MAKERS OF

SEARLE BUSH

UNIT COOLERS

SEARLE RADIATORS & REFRIGERATION LIMITED

have pleasure in announcing that on August 1st
they acquired the complete undertaking of

SEARLE AIRCRAFT SHEET METAL WORKS LIMITED

For many years our two companies have manufactured and sold refrigeration equipment as separate concerns although both Boards of Directors have been identical. It has been apparent for some time however that two concerns with such similar interests would function more efficiently as a single entity. There is to be no change in management or control, but it is confidently expected that complete integration will enable us better to serve the Refrigeration Industry.

Following this Amalgamation
it has been decided that from September 1st
the Company will change its name to

SEARLE MANUFACTURING CO. LTD.

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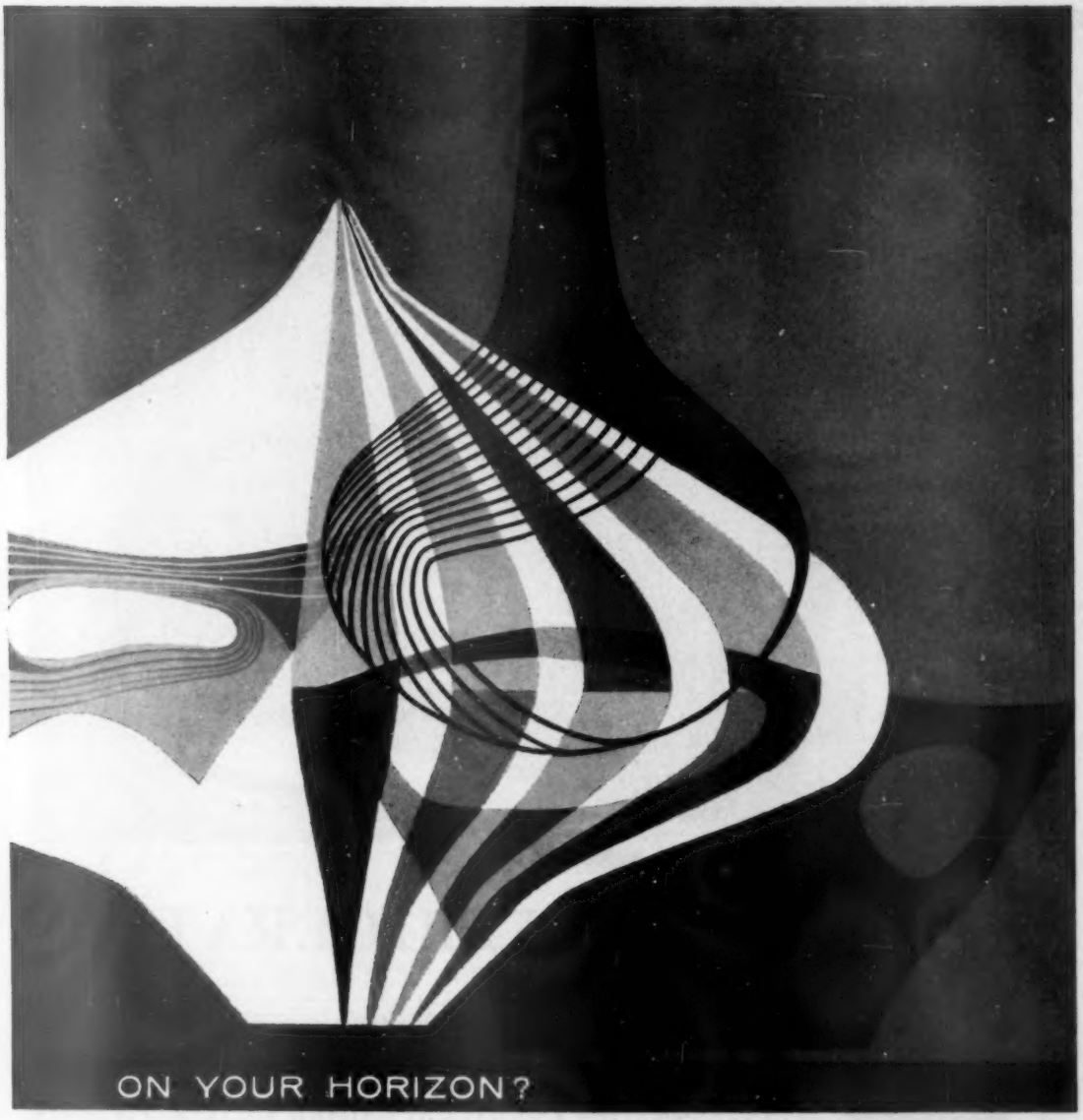
Factories : LONDON and FAREHAM



At this moment, on a drawing board somewhere, is a design which could mean an entirely new product. It could be a product for either light or heavy industry: for instance, toys or electronics, household appliances or chemicals. But whatever the field, when the time comes for bulk manufacture, there are powerful reasons—mechanical, chemical, dielectric and economic—for believing that the material chosen will be high impact polystyrene.

When that happens it will not be just happy chance if the selected brand of polystyrene is Iridon. Iridon Limited have the resources and the experience to meet the demands of every new development the moment it becomes a mass market proposition. Iridon Limited are constantly perfecting new techniques, new processes; constantly exploring the immense possibilities in plastics — always with the aim of fitting them for the ever-changing pattern of industry.

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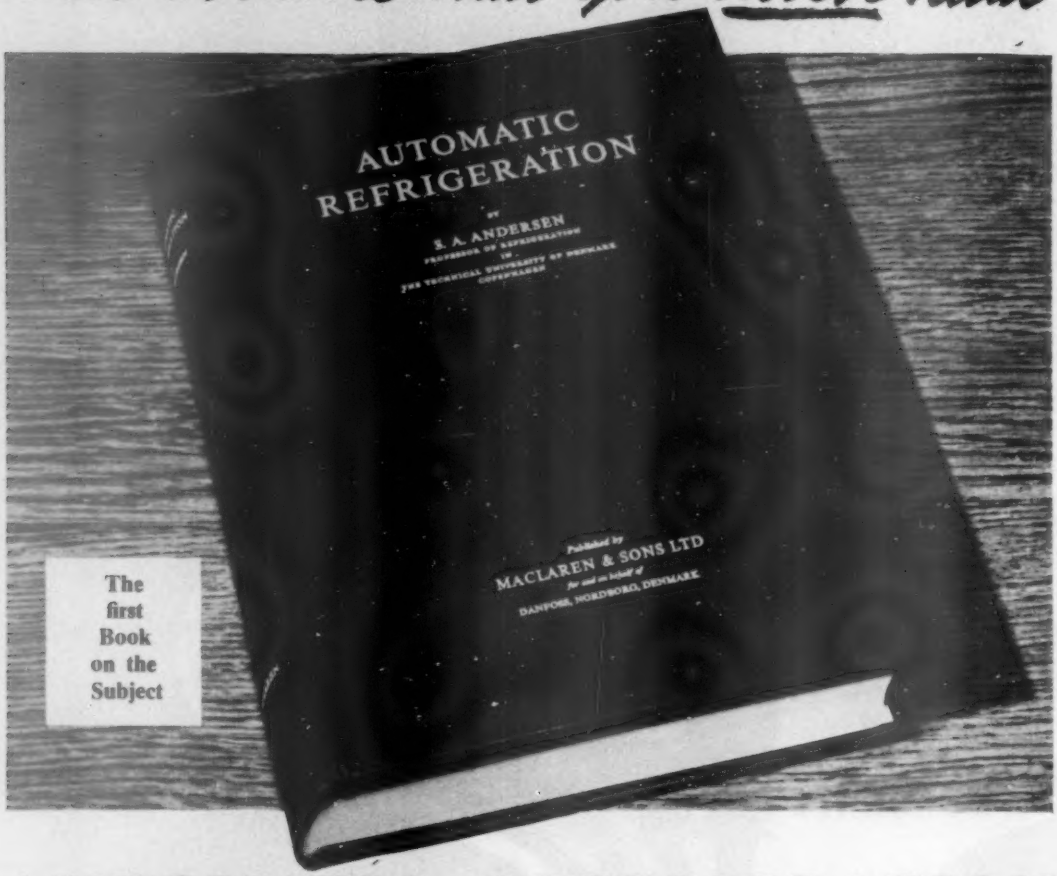

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650 pages
Numerous Sketches and illustrations

Price:
85/-

by S. A. Andersen
Professor of Refrigeration, Danish Technical University

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MODERN REFRIGERATION

and Air Control News

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and ICE AND COLD STORAGE

Established 1898

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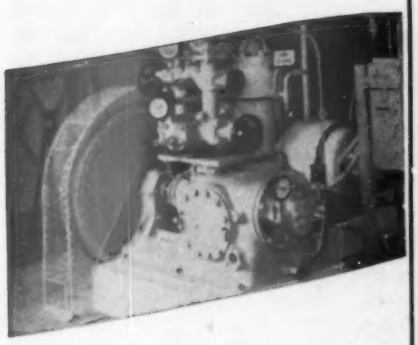

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VOLUME 62 NUMBER 738

September, 1959

Editorial . . . .

Our Perfect Danish Hosts

A Tremendous Programme

Stuttgart, 1963 (In the SPRING, please)

● So another " International " has come and gone. The latest of these four-yearly events, which embroiled at least four committees in eighteen months of preparatory work, has rounded off the first half century of international liaison in the refrigeration field.

● The 10th International of Refrigeration held in Copenhagen from August 19 to 26 (with an extra week of excursions) was a hustling affair that reflected great credit on the organizers and their counsellors in Paris. The outcome was considerable advances in the nine main avenues of study and a new understanding of I.I.R. co-operation by Americans, Russians and Europeans.

● Held under the patronage of King Frederik IX of Denmark, the congress was graced at its opening ceremony with the presence of the Danish Prime Minister whose inspiring address is to be found on page 748. A note of sadness was sounded by the announcement that the president of the general conference, Dr. Ezer Griffiths, O.B.E., F.R.S., United Kingdom, was unable to be present, on his doctor's advice. Two telegrams were sent from the conference —the first sending greetings to His Majesty and second conveying sympathy to Dr. Griffiths and wishing him full recovery. We are honoured to have a contribution from the latter in this issue.

● The venue for the congress meetings could hardly have been more ideal. The Royal Technical University in Copenhagen has a circular ground floor with open galleries to the top floor (see page 751). Radiating from this central area are lecture theatres of a size perfectly suited to either small or large assemblies. Fitted with transistor radios giving translations in two additional languages, the halls encouraged work to proceed at a brisk pace.

● The " technical visits and social events " side of the congress was just as effectively organized. It would be impossible in these pages to detail all these functions but certainly outstanding were the receptions offered by the City of Copenhagen and, the night following, by the Minister of Commerce in Christiansborg Castle; the concert arranged by the Danish Government in the Tivoli Concert Hall (the orchestra was conducted by Professor Svend Felumb, with Alberto Medici, concertmaster of the Danish State Radio Symphony Orchestra, as soloist—works included those by Niels W. Gade, I. P. E. Hartmann, Johan S. Svendsen, Knudage Riisager and Carl Nielsen). Technical visits included the Carlsberg and Tuborg breweries; a refrigerated fruit depot; a refrigerated ship lying at Elsinore; a supermarket; the Government Dairy Research Institute; the Atomic Energy Commission's plant at Riso; a bacon factory; an urban dairy; an ice cream factory; the Danish Meat Research Institute; a meat canning factory; an ice factory; a modern cold store; a hospital; a dry ice plant; a margarine factory; the technical laboratory of The Ministry of Fisheries; the Danish Refrigeration Research Institute; the air-conditioned studios for radio and television and a Russian fish factory ship nearing completion in the Burmeister and Wain yards—a rich diet indeed even for the strong in heart and limb.

● The second week of visits embraced the vast Agricold store at Esbjerg (a six-storied building of 840,000 c.ft.); the slaughterhouse at Graasten which has a tunnel freezer and a freezing store; a meat plant at Holstebro crammed with fridge plant (five single-stage compressors and one two-stage compressor); a co-operative undertaking at Brabrand owned by twenty-five bacon factories, with emphasis on fine automatic control; a co-operative poultry plant at Vamdrup; a mink farm owned by Count Castenskjold, with freezing plant for treating the fodder; a co-operative dairy at Ringsted having twenty-two refrigerated chambers; the Agricold plant at Naestved having cold storage and ice-making facilities; a factory producing plant protection agents at Koge—flake ice is in demand there; the very modern slaughterhouse at Roskilde; a bacon factory at Koge; a co-operative meat works at Ringsted having eleven refrigerating compressors; a canned fish factory at Glyngore needing refrigeration for storing the raw product; a bacon factory at Holstebro; the United Ice Factories at Esbjerg, manufacturing, among other items, " Premier Is " seen all over Denmark; cold stores at Kolding with over 2m. B.t.u./hr. extraction; the butter-making centre at Hjorring with seven cream tanks of a capacity of 900 gallons; the United Dairies at Aarhus supplying one-third of the Greater Aarhus area with dairy products, with 13,000 tons of weighed-in milk annually; the ice plant at Skagen producing ice for fishing craft and freezing and storing foodstuffs; the fish-exporting firm at Frederikshavn having a filleting capacity of 80 tons per 24 hours and an equal freezing rate; the bacon factory at Randers with a killing capacity of 200,000 pigs per annum; the fish-filleting factory at Esbjerg with seven compressors aggregating 1¼ m. B.t.u./hr. duty and a low temperature store capacity of 60,000 c.ft.; the clear ice undertaking at Esbjerg which in the group of four

plants has a capacity of 1,100 tons ice-making and the slaughterhouse at Kolding with freezing tunnels, a practice uncommon in Britain.

● Among the special attractions of the first week was, of course, the " Danfoss evening at the circus." This most enterprising firm from Nordborg took over for the evening the most famous circus in Europe, Schuman's, and thereby provided considerable delight for the 1,750 delegates from 43 countries attending the congress. Their colour film, " Around the world with Danfoss," shown as a curtain-raiser, set a standard of technical and artistic achievement that left most onlookers spell-bound.

● We wish to congratulate Professor R. Plank of Karlsruhe on being elected president of the general conference, in succession to Dr. Griffiths, and are glad that the executive committee paid him a further compliment by deciding to hold the 1963 congress in his country—at Stuttgart. We would like to raise our small voice here and suggest that the next event should be held in the *spring* of 1963, a time of year favoured greatly pre-war for refrigeration congresses; travelling is easier than at the height of summer while local ambients are not high enough to cause discomfort to refrigeration men who seem unwilling to provide air-conditioned surroundings for themselves. In our humble opinion, the sight of a refrigeration tycoon, with dinner jacket removed, busily mopping brow in a Tivoli banqueting hall is bad publicity for the industry !

● While listening to an excellent paper at the congress on some effects of cold on man by a distinguished British author we were reminded that, owing to the printing dispute, we had not devoted any space to the recent meetings of the British Occupational Hygiene Society in London; in the discussion period, Mr. B. C. Oldham made an extremely useful contribution. He said, in part :—

" The name and terms of reference of this society necessarily mean that the treatment of the subjects has a bias towards the protection of human beings to enable them to spend working hours in surroundings as healthy as those of school days or retirement, and to prevent the latter from being contaminated by industrial air-borne waste. Air is therefore a utility which, in the ideal case, should be taken into account in the siting of a mill or factory equally with the availability of power, water, drainage, communications and suitable labour. This reminds us that the forces of man are puny in relation to the forces of nature. In spite of the atmosphere extending upwards for miles, we are earthbound to a very thin sandwich of air and pie crust with animal and vegetable filling; our occupational hygiene troubles are largely due to this practically two-dimensional activity. Only a few of us emulate the freedom of birds and fish to partake of 3-D activity. We utilize only a few feet above the surface for so-called fresh air for workers in buildings or underground, and a few hundreds of feet of chimney stacks. If the layer of useful air could be extended in height to above the clouds, many problems of air-borne pollution would disappear and natural cooling could take the place of refrigeration. The problem of fresh air conservation to reduce heating or cooling loads would remain. The fresh air requirements from the occupational hygienist's viewpoint are for the conditioning of human beings and not the product. This raises the question—are the human beings always necessary? or are they to follow that docile animal, the horse, from ubiquity to the frontiers of the zoo, or rather from the arena to the grandstand? Many noxious operations are now carried out mechanically with a minimum of human attendants. If those attendants could be replaced by automation, what would be the effect? Precision automation apparatus requires air to be more expensively moved, cleaned, attemperated and humidity controlled, to narrower limits for correct functioning. It is more intolerant than the least tolerant of humans, who must therefore continue to be a major feature of design. Avoidance of contamination of environmental air for the workers or of outdoor air prejudicial to industrial neighbours or local residents can be taken care of to best advantage on the drawing board of the machine and process plant manufacturer by provision of either built-in airways and hoods or space for their efficient addition."

Chrysler Air-Conditioning arrives in Britain

AN important newcomer to the air-conditioning and refrigeration field in Great Britain is the Chrysler organization which is now located at Bowater House, Knightsbridge, London, S.W.

Under the title Chrysler International S.A., the nucleus of what will later be an impressive undertaking has been installed in London to take charge of all Chrysler activities in the sterling area—a territory extending as far as Japan. This territory is called " region 2 " ; " region 1 " and " region 3 " are centred on Rotterdam and Cuba, respectively. The head of " region 2 " is Mr. K. H. Kingsley, from Detroit, while in charge of the special products division is Mr. K. Bradley whom many readers will remember when he was within the Frigidaire distributor organization at Bournemouth.

The fields of air-conditioning in which Chrysler's intend to operate comprise the room conditioner and packaged conditioner markets and the 1-ton and up industrial business. Airtemp air-conditioning equipment has, of course, been well known in the States since the mid-30s' Heating plant will also be handled.

An early activity of the new organization will be the appointment of U.K. distributors—perhaps 15 in number.

NEWS OF THE MONTH

Refrigeration and A-c Exports.—During July, 1959, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £742,695 weighing 963 tons, was exported from the United Kingdom. Comparable figures for July, 1958 were 1,080 tons, worth £661,815.

* * *

Exports' Analysis.—Of the 963 tons of air-conditioning and refrigerating plant worth £742,695 exported by Great Britain in July—quoted in the preceding paragraph—86 tons went to the Union of South Africa, 34 tons to India, 42 tons to Australia, 54 tons to New Zealand, 42 tons to Canada, 184 tons to "other Commonwealth countries," 55 tons to Eire, 22 tons to Sweden, 93 tons to Western Germany, 73 tons to the Netherlands, 34 tons to Belgium, 15 tons to France, 26 tons to Italy, and 203 tons to "other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during July, quoted in the first paragraph, commercial refrigerators accounted for 188 tons, worth £115,153, industrial plant and equipment for 135 tons worth £124,725, refrigerating equipment and parts, including parts of commercial refrigerators for 384 tons, worth £304,098.

* * *

Exports of Small Refrigerators.—During July, 1,213 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £740,510. The 1,213 tons comprised 47 tons to the Union of South Africa, 19 tons to Rhodesia and Nyasaland, 13 tons to India, 46 tons to New Zealand, 584 tons to "other Commonwealth countries," 35 tons to Sweden, 23 tons to Western Germany, 34 tons to the Netherlands, 19 tons to Belgium, 128 tons to Italy, and 265 tons to "other foreign countries."

* * *

Large Frozen Confection Maker.—An ice lollie plant, capable of producing over 35,000 3 oz. lollies per 8 hour shift or 58,000 2 oz. lollies per 8 hour shift, was recently exported to S. Africa by James H. Randall & Son Ltd., of Paddington Green, London. This is one of the many export orders resulting from an overseas trip by Mr. James E. Randall, chairman of the company, manufacturers of the well-known Ranpad ice cream and ice lollie equipment. The crate for the tank alone measured 22 ft. 6 in. by 6 ft. 2 in. by 4 ft. 5in. and a special crane had to be brought to the London Docks to load the large crate; 1,650 ft. of 1¼ n.b. refrigeration coil weighing over 2 tons was fitted with a 50 h.p. compressor unit.

* * *

Ashrae Appointment.—Mr. Richard T. Biedler has been named advertising manager of the American Society of Heating, Refrigerating and Air-Conditioning Engineers in an announcement issued by Mr. Arthur J. Hess, president of the society. Mr. Biedler's office will be located at 62 Worth St., New York, N.Y. Mr. Biedler will supervise the national sales programme for "Ashrae Journal"—the society's monthly publication—and the 1960 "Heating Ventilating Air Conditioning Guide," as well as other annual publications now under consideration. Appointment of Mr. Biedler follows his association with the society as west coast advertising representative located in Los Angeles, California.

* * *

ASEE'S 1960 Exhibition.—The 9th Electrical Engineers Exhibition sponsored by the Association of Supervising Electrical Engineers will be held at Earls Court, London, from April 5 to 9, 1960. Provisional bookings by last year's exhibitors for stand space at the 1960 show have been heavy. In addition 45 new exhibitors have asked for space. This annual event is Britain's largest trade show and the exhibits include all types of electrical engineering equipment, accessories and raw materials. Each year the organisers arrange a feature showing the latest developments in a particular branch of electrical engineering. The 1960 feature will be "marine electrics."

* * *

The Cold Rush.—It is estimated that almost half a million housewives have bought a new refrigerator this year. Already, last year's sales total of 448,646 domestic refrigerators sold, has been passed—with four months to go. Despite an unusually good summer, the new record is exceptional. Last year, the previous record year, sales were some 60% higher than in 1957. Since January 1, 1958, just under one million refrigerators have been installed in British homes—a total which was only equalled over the six years between 1952 and 1957. In fact, housewives bought more refrigerators this year—in April alone—than they bought during the whole of 1952. But over three-quarters of British homes are still without a refrigerator.

* * *

FRIGIDAIRE PRICE REDUCTIONS

SUBSTANTIAL price reductions on frozen food display cabinets and a wide range of other commercial refrigeration products were announced last month by A. W. Porter, director and general

manager of Frigidaire Division of General Motors Ltd.

Mr. Porter, who gave details of the reductions during a review of the company's five point development programme for commercial refrigeration, now celebrating its second anniversary, also announced an immediate extension of the Frigidaire five year warranty on commercial compressors, the acquisition of new premises for engineering and research, and big production and sales increases.

Of the price reductions he said these were consequent on increased production and improved manufacturing techniques and would be effective immediately.

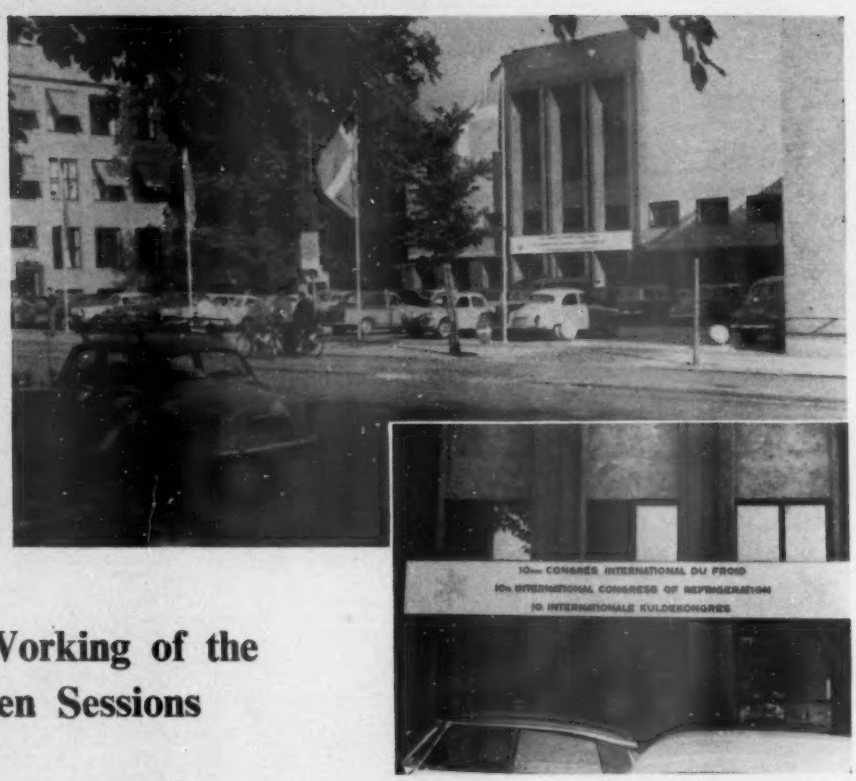
Prices of the popular frozen food display cabinets, models KFR-116 and KFR-137, have been materially reduced. In addition reductions of up to 10% have been made in the price of the MMH series of rotary condensing units and all models of reciprocating condensing units under 5 h.p., all gravity coils and ceiling and wall mounted forced air evaporators.

These reductions will have the direct effect of bringing down the cost to the food retailer of refrigerated display cases and counters, food storage cabinets and cold storage rooms.

Linked with these reductions is an extension of the company's five year warranty on *all* commercial refrigeration compressors, introduced for the first time by a refrigeration manufacturer when Frigidaire's five-point development programme for commercial refrigeration was first launched in June, 1957. Effective immediately, the warranty has been extended to cover for five years the *motors* on all new condensing units under 5 h.p.

Picture of the Month

Our illustration shows Dr. J. C. Fidler, O.B.E., B.Sc., of the Ditton Laboratory (A.R.C.), East Malling, Kent (left), being presented with the newly instituted Ottesen Medal by the Danish Prime Minister at the opening ceremony of the 10th International Congress of Refrigeration in Copenhagen last month. Commemorating the work of the late A. J. A. Ottesen of Denmark, who developed the first practical quick-freezing method, this award will be made every four years to the one who has "done outstanding work in the science or technique of refrigeration as determined by the field of work of The International Institute of Refrigeration." Dr. Fidler, who is 52, was born in Northumberland. From Hexham Grammar School he entered Armstrong College, Newcastle, and graduated B.Sc. in 1929. From 1929 to 1934 he worked with Professor Merion Thomas, F.R.S., on the carbohydrate metabolism (Zymasis) of plant tissue and was awarded his Ph.D. in 1934. In 1934 he went as a research student to St. John's College, Cambridge, and worked at the Low Temperature Research Station on aldehyde metabolism in plant tissue and obtained a Cambridge Ph.D. degree in 1937. In 1936 he joined the staff of the Food Investigation Organization (which has now been disbanded) and took charge of their Covent Garden Laboratory.



Smooth Working of the Copenhagen Sessions

THE "10th INTERNATIONAL" ADJUDGED "GREAT SUCCESS"

WITH a velvet touch those responsible for organizing the 10th International Congress of Refrigeration in Copenhagen set in motion, on the 19th *ultimo*, without a hitch, the proceedings that have conformed to a general pattern since 1908.

The opening ceremony, which was under the patronage of **H. M. King Frederik IX of Denmark,** was honoured by the presence of **His Excellency Mr. H. C. Hansen, Prime Minister of the host country.**

At this impressive event 43 countries were represented, these being drawn from member-nations which cover 65 per cent. of the surface of the globe.

The Prime Minister, who was welcomed to the dais by **Mr. S. Maaeted,** president of the Danish organizing committee, president of the Danish Association of Refrigeration and president of the Society of Danish Manufacturers of Refrigerating Machinery, said, in part :—

"On behalf of the Danish Government I have the honour to welcome the participants in the 10th International Congress of Refrigeration, in which Denmark takes part not only as a member of the International Institute of Refrigeration, but also as host to this congress. I am convinced that since the first congress held in Paris in 1908, these congresses have become of increasing importance to the theoretical as well as the practical development of refrigeration. It is my hope that your meetings here in Copenhagen will be a valuable contribution to the continued progress of refrigeration techniques.

"Living in an agricultural country whose industry is also expanding rapidly, one cannot help being reminded daily of the great scope and significance of refrigeration. To an audience like this I shall, of course, not go into the

The Danish Prime Minister opens "The 10th" . . .

. . . after having been welcomed by Mr. S. Mansted, chairman of the organizing committee and acting-chairman of the conference. (below)

Mr. J. Foulon, president of the executive, I.I.R., describing the work of The Institute.

Dr. J. C. Fidler, president of the technical board, addresses his audience, virtually without notes.

Extreme right: Professor R. Plank, later elected president of the general conference, speaks of the work of Ottesen.

details of these technical matters, but I would like to mention that refrigeration in Denmark led to a fruitful development of the engineering trade at a very early stage. Already about 1890 the production of refrigerating machines and complete refrigerating plants was taken up in this country.

"The Technical Museum of Denmark has placed one of these old refrigerators at the disposal of the congress for its exhibition. Refrigerating machinery and equipment for refrigerating plants are to-day one of the specialities of this country, and a large share of the machinery produced is exported.

"It is a well-known fact that great inventions are often made by practical people without specialized knowledge. As it happened, one of my countrymen, a fish exporter, Mr. A. J. A. Ottesen, Thisted, invented and patented the first real quick-freezing method, thus starting a development which even to-day is still in the initial stage.

"To-day everybody knows about deep-freezing. For instance, ice cream is probably known by people in all parts of the world. We are now making great progress with lines of even colder frozen foodstuffs and pre-cooked meals. In view hereof it seems very appropriate that the 10th International Congress of Refrigeration, in co-operation with the refrigeration industry and agriculture, has sponsored a comprehensive exhibition of frozen foods in the Congress Building. It is also very apt, from an international point of view, that the frozen foods exhibited have come from various countries so that specialists as well as consumers may have an opportunity—probably their very first—to make direct comparisons on such a broad basis.

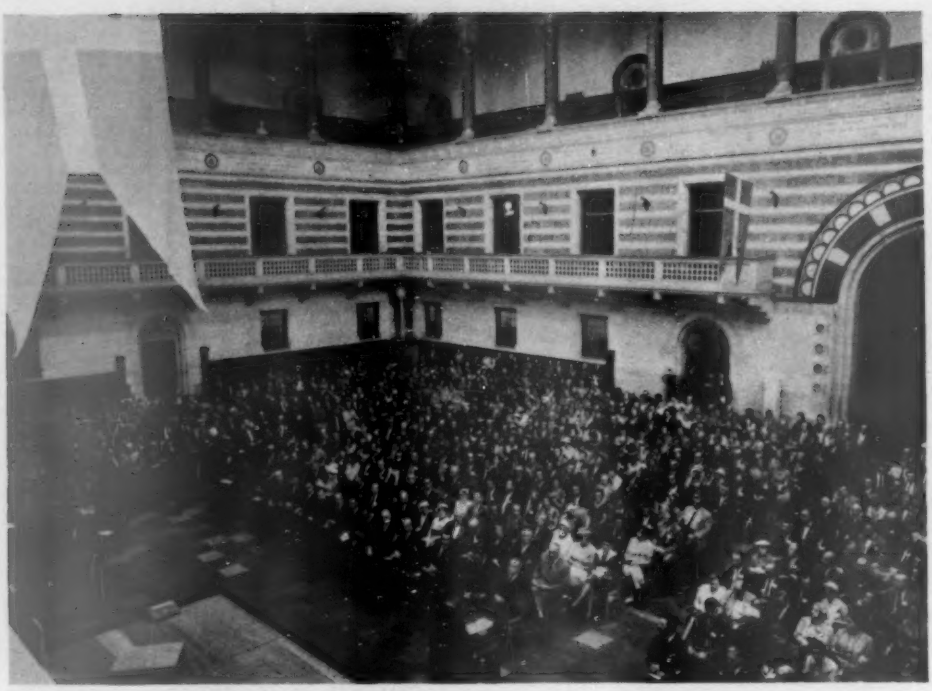
"Refrigeration is an industry of great importance to Denmark, and for Danish agriculture and fishery the introduction of refrigeration proved to be very important in our efforts to increase productivity.

"Danish farming and the auxiliary food industries play a dominant role in our economy. About 20 per cent. of the population are engaged in agriculture and the agricultural area, though decreasing, covers about three-quarters of the Danish land area.

"Agricultural exports amount to about 50 per cent. of the total exports and the output of agricultural products is still increasing.

"The progress achieved in the frozen foodstuffs industry is a fine example of the creative power of research, not least when it is based on intimate international collaboration.

"In Denmark research and education are centred on the universities of Copenhagen and Aarhus, and on the Technical University, where the meetings of this congress are being held. The Government has recently decided to build a new Technical University, a very large one in relation to the size of the population of this country. The preparatory studies for this project have already begun. We hope that at this university we shall be able to offer ideal working conditions for the future research and education in refrigeration.



Just one corner of the vast assembly at City Hall.

" Another factor, which has helped us to attain our present standard, is that Denmark has always had close and frequent contacts with technicians, scientists and business men from other countries. Such connexions have been extremely useful to us, and I am therefore looking forward with great expectation to the results of this congress, I hope it will be very successful and offer great results, not only to Denmark, but also to the International Institute of Refrigeration, and to all of you, ladies and gentlemen, taking part in this congress.

" I wish you welcome to this country, and on behalf of the Government of Denmark I declare the congress open."

Mr. Mansted, who occupied the chair through these proceedings, then announced the unfortunate news that **Dr. E. Griffiths,** O.B.E., F.R.S., U.K., president of the general conference of the I.I.R., could not be present, on his doctor's advice. Dr. Griffiths's address, however, was read by **M. R. Thévenot,** secretary-general of the I.I.R. and it ran as follows:—

" I much regret that owing to ill health I am unable to attend the congress. If I were present it would have given me great pleasure to welcome in the name of the I.I.R. the participants who have come from 43 countries to take part in this great event: the 10th International Congress of Refrigeration. The first International Congress of Refrigeration was held in Paris in the year 1908. It was then decided to create an international organization for refrigeration, so our Institute has recently celebrated its jubilee. We have a membership drawn from an area covering 65 per cent. of the surface of the world. May I express the hope that those countries which are not yet member-countries of the Institute will join us in the near future. This international co-operation is helping forward the development of the science and technique of refrigeration and ultimately improving the living conditions of mankind. On behalf of the Institute I wish to express our gratitude to His Majesty the King of Denmark who has consented to be the patron of this congress, to the Danish Government; to the City of Copenhagen; and to the Danish organizing staff. I am sure the congress will be a success, when we take into account the quality of the papers to be discussed and the number of participants drawn from so many countries."

Two telegrams were sent from the congress; the first to His Majesty—King Frederik, acknowleding the honour of his patronage of the congress and the second was sent to Dr. Griffiths expressing regret at his absence and wishing him an early recovery.

M. J. Foulon, director-general of " La Regie des Services Frigorifiques de l' Etat Belge " and president of the executive committee, I.I.R., then gave a short address on the past, present and future of the Institute, recalling that it was in 1908, on the initiation of France, that 2,000 members took part in the first congress in Paris. There was thus created an international organization which, to use the words of Professor Kamerlingh Onnes, "sought to unite all those interested in low temperatures." M. Foulon stressed the vast possibilities open to refrigeration—in fact, he said, its full force should be exerted in a world in which two-thirds of the population were underfed.

The technical work of the I.I.R. and of the 10th Congress was then explained, from the rostrum by **Dr. J. C. Fidler,** O.B.E., Ditton Laboratory, England, and president of the technical board. Dr. Fidler declared :—

"Strictly, the use of the words 'technical and scientific' is unnecessary, since the 'Agreement concerning the International Institute of Refrigeration' begins, in article 1, by declaring that the aim of the contracting parties is 'to collaborate fully in the study of scientific and technical problems relating the refrigeration. . . .'

"Further, your presence here is evidence of your interest in the work of the Institute; it would hardly be flattering

Messrs. Foulon, Fidler and Thévenot.

to suppose that you had not studied the *Bulletin* and its annexes, and were thus not acquainted with the work of the nine technical commissions.

"I have been connected with this work only since the last war, and can only speak at first hand of what has been done since then, but even in so few years an important and valuable collection of original papers has appeared. Now, the terms of the agreement could have been fulfilled, and an equally large number of reports printed, without there having been any fundamental difference between the I.I.R. and any national scientific society; we could have been merely a society with world-wide membership. But the Institute is more than that. In biology, it is axiomatic that the whole is greater than the sum of the parts. Here, the 'parts' are the commissions, the 'whole' is the technical board. This is more than a committee. It is a group of enthusiasts, each being a specialist in his own field, but with that wider vision which enables him to see the common interest. This is something which could often differ from a narrow national or sectarian interest.

"In this we read the heart of the matter; the members of the board become, in their meetings, truly international in outlook. No narrow nationalistic proposal has been put forward. To my mind, if such a thing ever did happen, the Institute would decline in strength from that day.

"It is precisely because our advice is scientific and technical, disinterestedly given, that other organizations, both national and international, look to us for help. Our whole aim is to help whether we are meeting in the smallest groups —the working party, or the largest—the congress.

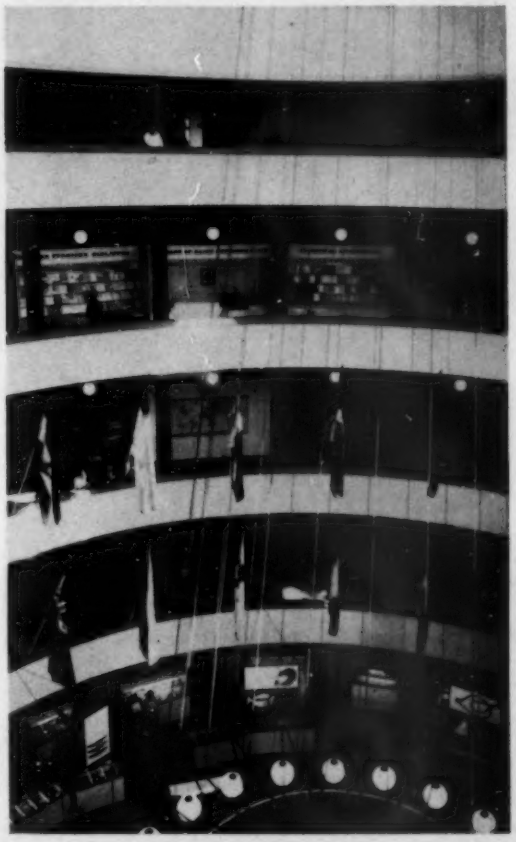
"You read the *Bulletin*, you know how many working parties there are, advising this organization or the other, considering questions of safety, testing, definitions, etc., all valuable work. But to-day, we stand at the beginning of a congress, which, under article 22 of the agreement, we must hold—'normally every four years.'

"Let us consider, for a few minutes, what is the function, or the aim of a congress. Why is it necessary to hold one, and what do we expect to gain from participation?

"The history of the Institute tells of changes of name and structure during the fifty-one years since the first step was taken to bring it into being, but it is a fact that the aims and objectives adopted by the first congress in Paris in 1908, remain unchanged to this day. The men who met then and had the foresight to think ahead, internationally, achieved a result rarely accomplished in any field, namely the foundation of a society on so firm a basis that only minor modifications have been needed, despite changes in technology and shifts of national frontiers.

"Thus, whatever may have been the aim of the first congress, its result was formative.

"The next two congresses followed quickly, in 1910 and 1913. The impetus here may well have been the need for



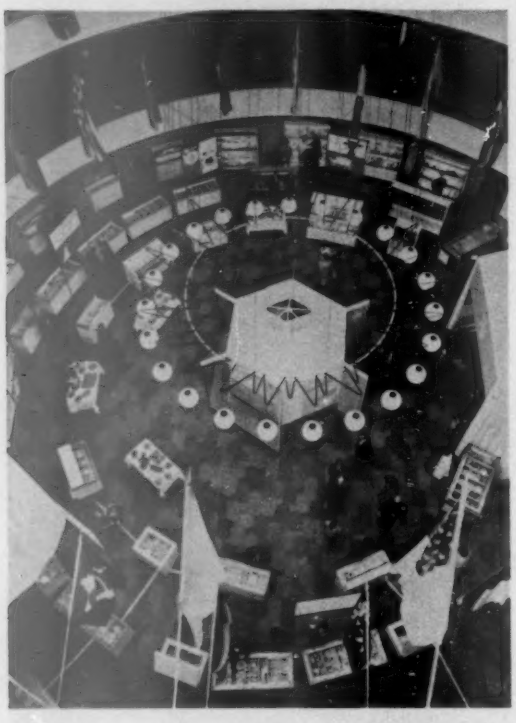
For registration and display purposes and for sessional meetings the layout of the university building was ideal.

a form of debate and interchange of ideas in a rapidly developing industry. For it must be remembered that these were the formative years for the national associations; how odd it is to think that international co-operation largely preceded national. Before the first congress there were only two national associations in existence, the British, founded in 1899, and the American, in 1904.

"There were then only three or four journals being published. Thus, refrigerationists in many lands were starved of ideas and contacts. Even in those countries which

developed national associations, meetings were normally held only in the metropolis; this is largely true, even to-day.

"The First World War exploded soon afterwards, and because of the economic devastation which followed it, the fourth congress had to wait until 1924; this was followed by three more at four-yearly intervals up to 1936. The number of communications presented, and the attendance, was not so great in those days, as it is to-day, nor did the commissions meet so frequently, in the intervals between congresses, as they do now. The congress was still a rare opportunity for discussion of current problems.



Frozen foods from all nations were displayed at the "hub" of this circular building.

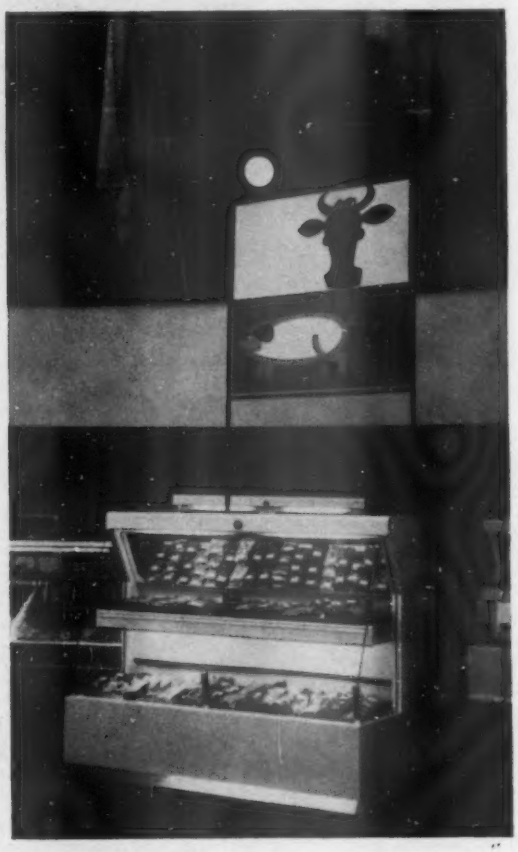
"You will have noted that I have said nothing about the value of the personal contacts established at such meetings; their value is indisputable, but while they are often quoted as a justification of a congress, they cannot be the main reason for holding one, nor the magnet which draws people to attend.

"No doubt an organization can go on holding congresses for a very long time, provided they are not too frequent, and be content that the congress should be merely a means of communicating papers, and discussing problems of mutual interest with other specialists in the same field. But this is a poor climate for active growth.

"What would have happened had not the Second World War intervened is anybody's guess, but this war set people thinking internationally who had never done so before. The Institute was rebuilt, and by 1951, it was possible to hold the eighth congress, in London. This broke no new ground, but under the surface, in committee, new ideas were circulating.

"A congress is primarily a scientific and technical occasion, for which the commissions invite papers, discuss them, and at times decide if any further action is needed and what form it should take. Frequently, joint sessions of two or more commissions are held, to discuss topics where their fields of reference overlap. But this is precisely what happens in between congresses. Commissions meet, often in joint session, and discuss special topics in a thoroughly uninhibited fashion. The organisation of the sessions of a commission at a congress is in the hands of its president; the meetings can be, and often are, remarkably like those held between congresses.

"To my mind, anyone who sits solidly through session after session of any one commission is not getting the maximum benefit from a congress. This general problem is one which has engaged the attention of the technical board over the past eight years. The key to the solution lies in a consideration of the membership—who comes, and what do they expect? You will not, I am sure, take it



Refrigerated, prepackaged foods made up other exhibits.

amiss if I say that most of you are normally too much engaged in day-to-day problems of business, or in your own specialist field, to be able either to take part in the somewhat academic commission business of the Institute, or to do all the reading you would like to do. For you, a congress should be a chance to hear what has been going on in refrigeration in the last four years. And this not only in your own field; what has been happening in low-temperature physics, what are the latest ideas of the Americans on air-conditioning, or of the Russians on freezing of fish, how is radiation technology going to affect cold-store operation? You are not specialists in all these subjects; the jargon in which many soi-disant scientists or

In the spaciousness of the transistor-equipped, large auditorium, several hundred delegates were able to attend the plenary sessions.

technologists present their material is often meaningless to you. What you want is to hear of progress in simple, yet accurate, everyday language.

"At this congress, as in Paris, we are attempting to do this; this time we have three plenary sessions and an evening discourse. I, for one, shall be disappointed if I cannot understand every word.

"One way of looking at what we are trying to do is to think of a long term project for a very large mural painting. Every four years you, the customers, come along to see the broad sweeps of colour, and how the figures and composition are shaping. In between, the commissions get on with the detailed brushwork and the overpainting of errors.

"Of course, if you are interested in brushwork, it is here for you; you can compare the palette of Glansdorff with that of Kuprianoff, or the dadism of Nunzio with Verlot's action painting.

"In any event, I hope you are determined, as I am, to get the maximum of information, and the maximum of fun, out of this very exciting, instructive, and no doubt exhausting occasion."

At this point, the chairman announced :—

"I have the honour to inform you that the Danish organizers of this congress have decided to institute a gold medal to commemorate the invention of the first practical quick-freezing method. This method, which has attained world fame, was first used by the Danish fish exporter, A. J. A. Ottesen, fifty years ago. It has been decided that this medal normally shall be awarded every fourth year in connexion with the International Congress of Refrigeration. It shall be awarded to a person who has done outstanding work in the science or technique of refrigeration as determined by the field of work of the International Institute of Refrigeration.

"An accompanying diploma will be presented together with the medal. The initial presentation will take place shortly. The first diploma is naturally ready, but the actual medal is presently being struck

In the more intimate atmosphere of the small lecture halls accommodating the meetings of commissions, it was a matter of coats off and down to business.

by the Royal Danish Mint, and will be sent to the recipient as soon as possible.

" We have instituted this medal to commemorate the work of our compatriot, A. J. A. Ottesen. Not many people know Ottesen, his work, and method as well as Professor Rudolf Plank, who has kindly

On the third floor of the University building, there was staged an excellent display of refrigerated transport models —both land and marine.

agreed to speak about it. In the world of refrigeration, everyone knows Professor Rudolf Plank, so I shall introduce him only by thanking him because he so kindly agreed to speak on this occasion."

Professor Rudolf Plank of Karlsruhe, Germany, then delivered a masterly survey of the life and work of the late A. J. A. Ottesen. He said :—

" Anton Jesenius Andreas Ottesen was born in Thisted on the Limfjord in Denmark on December 15, 1860, as the son of a fish exporter. In his youth he was employed several years in the office of a lawyer, but very soon he began to help his father and later on he directed this enterprise independently. His aim was always to improve the quality of fish and to preserve its fresh state as long as possible. Fifty-one years old, in 1911, he invented his famous quick-freezing process which very soon spread all over the world. It is indeed important to point out that in this case a practical man without any scientific training was able to appreciate, by intuition, the complicated colloidal and chemical processes, which take place during freezing of animal tissues and could indicate the way in which the smallest changes occur.

" Ottesen was not only in possession of a biological instinct but of a high technical ability as well. He was aware that fish frozen in cold air was deficient in quality and that the long freezing time was commercially unprofitable. No appreciable advantage could be reached by applying lower air temperatures. Real success could only be reached by increasing the freezing speed 20 or 30 times. Thus, fish was to be frozen in a medium of much higher thermal conductivity than air. Freezing of meat and other perishable articles by immersing into brine with or without a covering was already recommended in a patent application of Everhard Hesketh and Alexander Marcet both in London in 1889. Freezing fish in mixtures of ice and common salt was applied in the 80s and 90s of the past century by Inspector Wallem in Norway and was later improved by Henrik Bull and Nikolai Dahl in Trondheim. However, these processes had an inherent disadvantage : salt from the concentrated solution penetrated into the fish body and influenced adversely the taste and keeping capacity.

" In 1911 Ottesen applied for a Norwegian patent which was granted to him in 1913. His basic idea was to freeze fish in an *unsaturated* solution, which was to be cooled down to its own freezing point. A solution of this kind has no tendency to give up salt to the surroundings and to become even more diluted. On the contrary it tends to separate ice and to increase its salt concentration. Thus, no salt would penetrate into fish immersed in such a solution, the osmotic activity being at its minimum.

" The penetration of small amounts of salt into the fish could of course not be avoided, because the fish immediately after immersion are warmer than the solution and therefore the liquid film on its surface is no longer at its own freezing point. To minimize salting Ottesen recommended to precool the fish down to 0° C. and to use an efficient agitator in the cold bath.

" During 1912 to 1915 patents were granted to Mr. Ottesen in several European countries and in the U.S.A. The German patent office asked for a proof that salt penetration is much smaller in an unsaturated as compared with a saturated solution. These experiments fully confirmed Ottesen's views and gave me the opportunity to enter in close personal contact with him, which finally lead to a great friendship. The decision was made to investigate exactly the advantages of his freezing method, especially the influence in the speed of freezing on the changes which take place in the structure of the tissues. Extensive experiments have been carried out by me in close collaboration with Professor Ehrenbaum and Dr. Reuter in Hamburg and a permanent exchange of our views with those of Mr. Ottesen.

" Ottesen's work was efficiently supported from the beginning by the firm Thomas Ths. Sabroe and Sons, who designed and constructed the first freezing installations for the company of Mr. Ottesen and also erected the first freezing plant on board the steamer *Karmoy* at Haugesund. During the following years, fish freezing plants were built in China, Denmark, France, Germany, Great Britain, Iceland, Sweden and in the U.S.A. I was privileged to carry out freezing experiments with fish species in the far east and to introduce the Ottesen method in Shanghai.

" Any inventor has his predecessors and also his followers, who try to participate in his success. But there also exist real developments leading to new techniques of independent value. Thus, modern immersion freezing processes avoid any direct contact between the products to be frozen and the cold bath, by putting the product in thin evacuated latex bags (the so-called Cry-O-Vac process) ; this is of course much more efficient than the use of boxes of pockets mentioned in the old patent of Hesketh and Marcet.

" There is no doubt that Ottesen first clearly demonstrated the advantages of a high speed of freezing with regard to the quality of the frozen products and to the economic operation of a freezing plant. He gave the initial impulse to the development of the quick-freezing industry of to-day and to its general recognition. His name must be preserved in the history of refrigeration as that of a real pioneer in the field of food preservation and of an honest fighter for the realization of his ideas."

The Prime Minister then presented the award to Dr. J. C. Fidler.

After an intermission, during which delightful orchestral music was played, as indeed it was before the opening ceremony was performed, Mr. Mogens Jul, director of the Danish Meat Research Institute and president of the papers committee, spoke of the role of refrigeration in the world food supply. " It is generally assumed that the greatest part of all refrigerated installations are used for processing, transportation, and storage of foods and their use in the home," said Mr. Jul. " This may not necessarily be correct. The I.I.R. (1956b) indicates that about

66 per cent. of all refrigerating machinery manufactured in the United States is used for non-food purposes. Forty per cent. is used for air-conditioning alone. For the world as a whole, however, it is likely that food is still the largest user of refrigeration and it is also likely that the use of refrigeration in the food industries will develop at a very rapid pace in the years to come." *(This address will be given in full next month.)*

At the first plenary meeting on the 20th *ultimo*, the subject was "Recent Developments and Trends in Refrigeration Machinery." This was handled by three speakers from the three greatest areas of refrigeration activity, America, Europe and Russia —by **Mr. J. F. Downie Smith,** vice-president research and development division, Carrier Corporation, N.Y. U.S.A., by **Professor S. A. Andersen,** professor of refrigeration, The Technical University of Denmark and by **Mr. A. F. Joffe,** The Institute of Semi-Conductors, Academy of Sciences of the U.S.S.R., Leningrad, respectively. **Professor F. Glansdorff** took the chair at this session.

* * *

THE second plenary session was held on the 21st *ultimo* when the whole field of "Refrigerated Transport of Perishable Foodstuffs" was surveyed; this included sea, air and land means of carrying "non-dry" foods. Invited speeches were made by M. Pieffort of Switzerland who handled the land and air categories, while A. Christiansen from Denmark looked after the marine aspect. Useful contributions to the above subject came from C. Kobulashvili of the U.S.S.R. who discussed refrigerated railway trains in his country and from G. Labonne, Switzerland and M. Maurer, France. The able chairman through this session was M. D. Palmieri, Italy. *(Extracts from these papers will be published next month.)*

* * *

THE third plenary session on the 24th *ultimo*, Dr. A. S. Parkes, United Kingdom, presided over the first-ever such assembly to be entirely devoted to "Refrigeration and the Human Being." As the chairman pointed out, this was a subject vital to the future of space travel. Two excellent papers were presented by O. G. E. Sholm, head of the division of human physiology, National Institute for Medical Research, London; his address was entitled, "Some Effects of Cold on Man." The second paper was by Dr. R. K. Andjus, Institute of Physiology, Belgrade, who spoke on "Internal Cold: Protective Effects, Cold Death and Reanimation." *(Abstracts from these papers will be given next month.)*

The leading refrigeration journals of the world were displayed on this wall—three from France, two from Germany, one from Russia, one from Denmark and one from Great Britain.

* * *

The congress venue lent itself admirably to the purpose in hand—the simultaneous holding of many meetings and commissions, with a large assembly hall for plenary sessions, the display of the frozen foods of all nations, the exhibition of the technical refrigeration literature of the world and special shows devoted to refrigerated transport, teaching aids, heat pumps, automatic controls, demonstration plants, scientific appliances (including the diffusion cloud chamber, Philip's universal cooling machine for industrial processes and liquefying air and other gases), a Danish technical library of refrigeration works, an exhibit entitled "The Start of Dairy Refrigeration," and a technical museum showing a vintage Atlas NH_3 machine which operated at the Korsor Margarine factory from 1898 (the year of the birth of this journal) up to 1948.

British machinery makers get together in Copenhagen

(See opposite)

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This Continental group includes, left to right, rear, Professor A. Glansdorff and Mrs. Glansdorff, Belgium, M. R. Thévenot, France, and Professor A. Gorter, Holland, and Mrs. Meyer, Denmark.

The social side of the congress is dealt with on our leader-pages.

Of all the visiting delegations, that from Great Britain had most adherents. British members included :—

Adsetts, William Norman, Mr.; Fibreglass Ltd., Ravenhead; Aulds, Kenneth, assistant engineer-in-chief; J. Lyons & Co. Ltd., London; Barber, Cecil Robert, Mr.; National Physical Laboratory, Teddington; Barlow, Charles Gerald J. Lyons & Co. Ltd., London; Barnes, Ella M., Dr., Low Temperature Research Station, Cambridge; Batt, Edwin George, C.INST.R., M.R.S.H., Marco Refrigerators Ltd., London; Beasley, Stanley Arthur, chief performance engineer; Joseph Lucas (H. & C.E.) Ltd., Birmingham; Beattie, John, James; British Embassy, Paris; Bird, George Leslie Harper (secretary, Comm. III); mechanical engineering dept. Borough Polytechnic, London; Blount, Bertie Kennedy, Dr.; Department of Scientific and Industrial Research, London; Booth, Norman, managing director; British Oxygen Research & Development Ltd., London; Bossard, Frank, Mr.; Stoke D'Abernon; Brewster, James, Mr.; Hector Whaling Ltd., London; Brier, John H.; Seagers Ltd., Dartford; Brown, Fred, Dr.; Research Institute (Animal Virus Diseases), Pirbright; Burgess, Geoffrey H. O., Dr.; Humber Laboratory, Hull; Burman, Ernest William, Mr.; Teddington Refrigeration Controls Ltd., Richmond; Carruthers, D. S., managing director; L. Sterne & Co. Ltd., London; Castle, Walter Francis, Mr.; technical group-development dept. British Oxygen Engineering Ltd., London; Caston, Donald Forbes, asst. sales manager (technical) Ekco Plastics Ltd., Southend-on-Sea; Clarke, Gilbert L., engineer, York Shipley Ltd., London; Cochrane, Robin Dundonald, engineer; J. Stone & Co. (Deptford) Ltd., London; Cooper, Alfred; Expanded Rubber Co. Ltd., Croydon; Cromarty, Adam Sloane; East Grinstead; Cromarty, Robert William, Port Line Ltd., London; Danagher, J. H., manager, marine division; The Drayton Regulator and Instrument Co. Ltd., West Drayton; Dawson, John Howlden, northern marine manager; Newalls Insulations Co. Ltd., Washington; Deanesly, Ruth, Dr.; National Institute for Medical Re-

A group from the Far East who delivered several papers and took part in the discussions.

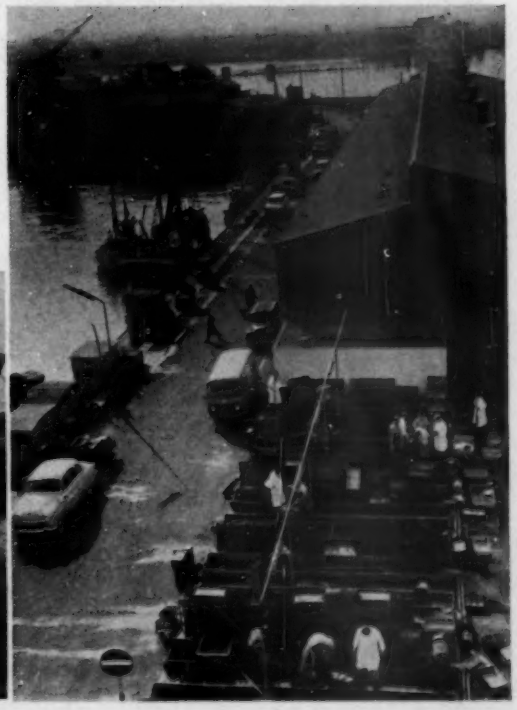
Photographs opposite, right to left: 1. Mrs. Howie, Mr. J. A. Howie, Mrs. Rowledge, Mrs. Raymond, Mrs. Huntingdon, Mr. E. G. Rowledge and Mr. A. Huntingdon; 2. left to right: Mrs. Fidler, Mr. T. Whittaker, Mr. E. M. Heap, Dr. J. C. Fidler, Mrs. Heap, Mr. J. J. Beattie and Mrs. Whittaker; 3. left to right: Mrs. Howie, Mrs. Steward and Dr. B. K. Blount; 4. right to left: Mr. W. S. Douglas, Mrs. Douglas, Mrs. Kewley, Mr. J. Douglas, Mrs. Douglas, Mr. G. L. H. Bird and Prof. C. A. Geneve; 5. left to right: Dr. Blount, Mr. Beattie, Mrs. Beattie, Mrs. Fidler, Mr. Howie, Col. H. Randal Steward and Mr. W. S. Douglas; 6. left to right: Mrs. Kewley, Mr. Kenneth Lightfoot, Mr. S. E. Kewley, Mrs. Saunders, Mrs. Lightfoot, Mr. C. S. McVey, Miss Saunders and Mr. N. F. T. Saunders.

search, London; De La Bere, Sir Rupert. Institute of Refrigeration, London; Donald, Matthew Corrance, chairman & managing director; William Kemp & Co. (Refrigeration) Ltd., Glasgow; Douglas, James; L. Sterne & Co. Ltd., London; Douglas, Thomas Ewan McQueen; William Douglas & Sons Ltd., London; Douglas, William Stoddart; William Douglas & Sons Ltd., London; Duly, Sidney John; Minikay Ltd., London; Eames, Trevor A.; British Railways Research Dept., Derby; Ede, Allan John; Mechanical Engineering Research Laboratory, Glasgow; Edholm, O. G., Dr.; Medical Research Council Laboratories, London; Edmonds, Raymond; Department of Scientific and Industrial Research, London; Fidler, John C., Dr.; Ditton Laboratory, Larkfield; Fidler, Roy, Director; F. W. Fidler & Son Ltd., Denton (Manchester); Fields, Frank, general sales manager; Ranco Ltd. (Scotland); Sunbury, Thames; Finlay, Robert; Wm. Milne Ltd., Glasgow; Fischer, Harold Walter; York Shipley Ltd., London; Fuller, Alfred Hedley, Lieut. Col.; Metropolitan Refrigeration Ltd., London; Galloway, Ian, Dr.; Research Institute (Animal Virus Diseases), Pirbright; Garraway, Alan, Technical Director; F. W. Fidler & Son Ltd., Denton (Manchester); Girvan, William, superintendent engineer; Peninsular and Oriental Steam Navigation Co., London; Gosney, William Bell, editor *Journal of Refrigeration*, London; Griffith, Miriam V., Miss; Electrical Research Association, Leatherhead; Gurney, John Desmond; de Havilland Propellers Ltd., Hatfield; Hagger, Frank Joseph, lecturer in refrigeration; National College for H.V.R. & F.E., London; Hales, Kenneth C., technical director; Refrigerated Cargo Research Council, Cambridge; Hampton, Horace Arthur; Imperial Chemical Industries Ltd., Dyestuffs Division, Manchester; Harding, G. O.; Clarendon Laboratory, Oxford; Haselden, Geoffrey Gordon, senior lecturer; Imperial College of Science and Technology, London; Hay, David, director; McEwans Insulaters Ltd., Clydebank; Heap Elliott Morley, managing director; York Shipley Ltd., London; Heard, John Arthur Edward, director; Carrier Engineering Co. Ltd., London; Heckmatt Harry H., research engineer; "Shell" Research Ltd., Handbridge, Chester; Herbert, John Trotman; J. T. Herbert Ltd., Beneden; Hickmott, Brian, director and marine manager; Norris Warming Co. Ltd., Newcastle upon Tyne; Hill, George Henry, construction manager; The Distillers Co. Ltd., London; Howie, John Abbott, managing director; Lightfoot Refrigeration Co. Ltd., Wembley; Hull, D., Dr.; United Kingdom Atomic Energy Authority, Harwell; Hunns, George H.; chief sales engineer; Frigidaire Div. of G. M. Ltd., Hendon; Huntingdon, Algernon; York Shipley Ltd., London; Hurd, Reginald; Imperial Chemical Industries Ltd., Dyestuffs Division, Manchester; Hutchinson, John A.; Refrigeration Press Ltd., London; Jason, Alfred Charles, Dr.; Torry Research Station, Aberdeen; Jennings, Gerald Ernest; Minikay Ltd., London; Jones, Kenneth Edward, refrigeration consultant; Dean & Wood, London Ltd., London; Jones, William Peter; G. N. Haden & Sons Ltd., London; Kitschell, Alan Greener, Dr.; Dept. Scientific & Industrial Research, Low Temperature Research Station, Cambridge; Laing, George, technical director; Miller Insulation & Eng., Glasgow; McAllister Leask, Michael John; The Clarendon Laboratory, Oxford; Lee, David Thomas, secretary; Institute of Refrigeration, London; Lightfoot, Kenneth, chairman; Lightfoot Refrigeration Co. Ltd., Wembley; Littlewood, Anthony; British Oxygen Engineering Ltd., London; Lomer, Jenifer N., Dr.; Physics Research Laboratories, Reading University, Reading; Love, Robert Malcolm, Dr.; Torry Research Station, Aberdeen; Lukass, Karl, Dipl-Ing., Linde Refrigeration & Machinery Ltd., London; Mackenzie, James; North British Cold Storage & Ice Co. Ltd., Edinburgh; Macvicar, James Kennedy Wilson, director; Thermotank Ltd., Glasgow; Mander, Norman Charles; Central Electricity Gen. Board, Tipton; Marks, Cecil Montefiore, managing director, Hussmann British Refrigeration Ltd., London; Meadows, Victor, Sidney, chief refrigeration engineer, Westwick Frosted Products Ltd., Norwich; Milligan, William; York Shipley Ltd., London; Monroe, Adam Gregory, research manager; British Oxygen Research Development Ltd., London; Montgomery, H., Dr.; United Kingdom Atomic Energy Authority, Harwell; Morton, Ian Stuart; Shell Petroleum Co. Ltd., London; Morison, Theodore D., director; Lightfoot Refrigeration Co. Ltd., Wembley; Murdoch, Archibald C., chief research & development engineer; Prestcold Division, Pressed Steel Co. Ltd., Oxford; Murray, R., councillor; City of Manchester Markets Department, Manchester; Mutch, R. L., research engineer; English Electric Co. Ltd., Whetstone; Parkes, A. S.; National Institute for Medical Research, London; Parkes, John; London; Parrott, John Edwin, Dr.; AEI Research Laboratory, Aldermaston; Pearson, Stephen Forbes, Dr.; Torry Research Station, Aberdeen; Perry, Edward James, refrigeration engineer; U.D. Engineering Co. Ltd., London; Perry, John Eaton, Foy chemical engineer; The Distillers Co. Ltd., Engineering Division (South), London; Petersen, Gunnar Kofoed, engineer; Lightfoot Refrigeration Co. Ltd., Wembley; Representative from Petrocarbon Developments Ltd.; Phillimore, B. A.; J. & E. Hall Ltd., Dartford; Pimblett, Alan; Fibreglass Ltd., Ravenhead; Pitts, Godfrey Yate, M.ENG., M.INST.R., director; B. Jaquiss & Sons Ltd., Manchester; Powell, Reginald Walter, Dr.; National Physical Laboratory, Teddington; Rae, I. M., Transport & Cold Storage Manager; Birds Eye Foods Ltd., London; Raymond, Theodore A., managing director and editor-in-chief; Refrigeration Press, Ltd., London; Rayner, Leslie C. C.; Lightfoot Refrigeration Co. Ltd., Wembley; Reay, George Adam, Dr.; Torry Research Station, Aberdeen; Ridd, Ivor Charles; York Shipley Ltd., London; Rixon, J. A.; City of Manchester Markets Department, Manchester; Roberts, Stanley Kelsall, sales manager; Imperial Chemical Industries Ltd., Manchester; Rowledge, Eric G, senior director; Prestcold Division, Pressed Steel Co. Ltd., Oxford; Ruddin, Eugene; Central Cold Storage Co., Liverpool; Ruhemann, Martin, M.I.CHEM.E.; Petrocarbon Developments Ltd., Manchester; Sankey, Leslie Gwynn, secretary; New Zealand Shipping Co. Ltd., London; Saunders, Norman F. T., managing director; Kelvinator Ltd., Bromborough; Seddon, William Leslie, B.SC.(TECH), A.M.I.CHEM.E., Petrocarbon Developments Ltd., Manchester; Smith, Audrey U., Dr.; National Institute for Medical Research, London; Smith, Kenneth Cecil, British Oxygen Research & Development Ltd., London; Smith, William

At Copenhagen's fine new social centre, the Falconercentret, the 1,750 delegates were entertained.

At the Wivex Restaurant on the edge of The Tivoli, approximately 800 delegates and wives sat down to a delightful banquet. In the foreground is an all-British table including left, Mr. W. S. Douglas, and anticlockwise, Mrs. W. S. Douglas, Mr. J. Douglas, Mrs. J. C. Taylor, Mr. G. L. H. Bird, Mr. S. B. Turner, Mrs. H. R. Steward, Mr. D. T. Lee, Mr. D. F. Caston, Mr. E. J. Perry, Mrs. S. B. Turner, Colonel H. Randal Steward, Mr. J. C. Taylor, and Mrs. J. Douglas.

Right: Copenhagen fish market and cold store visited by delegates early one morning.



Below: Russian fish factory ship of 1,500 tons deadweight being fitted out in Burmeister and Wain's yard at Copenhagen; this vessel will freeze 50 tons of live fish every 22 hours.

Hugh; Dept. of Scientific & Industrial Research, Ditton Laboratory, Kent; Stanley, M. C., director; Hay's Wharf Ltd., London; Stephens, Raymond W. B., Dr.; physics dept, London; Steward, H. Randal, Colonel; chief engineer Hay's Wharf Ltd., London; Stockdale, H., Councillor; City of Manchester Markets Department, Manchester; Stott, John Richard; British and Commonwealth Shipping Co., London; Strachan, Richard R., superintendent engineer; New Zealand Shipping Co. Ltd., London; Suddaby, Arthur, Doctor; Minikay Ltd., London; Sutton, J. E., Dr.; Mechanical Engineering Research Laboratory, Glasgow; Taylor, James Charles, managing director; U.D. Engineering Co. Ltd., London; Telfer, Thomas; Lloyd's Register of Shipping, London; Timewell, Herbert Charles, manager; The English Electric Co. Ltd., Liverpool; Tomkins, Ronald George, Dr., Ditton Laboratory, Kent; Trace, Leslie Herbert; The Laboratories J. Lyons & Co. Ltd., London; Turner, Stuart Browning, sales director; Expanded Rubber Co. Ltd., Croydon; Ward, Joseph Byron; J. & F. Ward, Grimsby; Wearmouth, William Gardiner, Dr.; National Institute for Research in Dairying Shinfield; Webb, Robert William, senior lecturer; National College for Heating, Ventilating, Refrigeration & Fan Engineering, London; Webber, Robert T., Dr.; U.S. Office of Naval Research, London; Webster, Thomas John, Dr.; British Oxygen Research & Development Ltd., London; Weiss, Leonard, Dr.; Medical Research Council, London; Whitaker, T., director; British Refrigeration Association, London; Wilks, John, Dr.; Clarendon Laboratory, Oxford.

THERMAL INSULATION AT THE "10th"

An Expert's View of Commission II Papers

By Dr. EZER GRIFFITHS, O.B.E., F.R.S.
past-president of the general conference of the I.I.R.

At the 10th International Congress many important contributions were made in the field of insulation technique. One of the interesting developments in recent years has been the production of rigid foams *in situ*. These are known as polyurethane foams. It is stated that the toxicity hazard is not great. Cheap, portable foam dispensing machines have been produced and techniques evolved for the filling of cavities such as bulk heads and deck heads as well as the usual wall space.

It is possible to prepare foams of density of half a pound per cubic foot.

When applied against steel polyurethane foams constitute an anti-corrosion barrier equivalent to that of many commonly used primers. Used in laminates their contribution to fire is stated to be not markedly greater than that of plasterboard.

Another contribution deals with the low-temperature properties of expanded ebonite. This material is probably the earliest cellular plastic introduced for low-temperature insulation and is produced by vulcanizing rubber under nitrogen pressure and releasing the pressure at the appropriate time.

Data are provided as to conductivity, compression strength, tensile strength, impact strength and the coefficient of linear contraction.

The range of temperature covered is room down to –196° C.

There was a paper on the coefficient of expansion of polystyrene foams and it is shown that there is a hysteresis effect.

As regards the measurement of thermal conductivity, efforts are still being made to find more speedy methods than those of the stationary temperature state. The probe method was the subject of one of the papers at the congress. Theoretically it is based on the measurement of the temperature distribution with time in the neighbourhood of an infinitely thin and infinitely long straight heater producing a constant quantity of heat. In practice the thickness of the heater cannot be neglected which sometimes has a covering of protecting material. Also the finiteness of the length of the heater is a factor. These points are examined mathematically by the author of the paper. Their importance will be appreciated when it is stated that the "apparent" conductivity may be twice the real value exactly at the end of the heater.

Another paper deals with the single-plate apparatus for low-temperature conductivity tests. The range covered is from 300° K. down to liquid nitrogen or liquid hydrogen temperatures.

These two papers illustrate the diversity of apparatus used for conductivity measurements and it is highly desirable that comparisons be made of the data obtained by different types of apparatus. Since the size of test specimen is not common to all, the obvious procedure would be to have a stock of material of uniform composition and draw upon it for samples for the checking of new forms of apparatus. This suggestion received approval at the meeting of Commission II in Prague in 1958.

Turning to other papers presented at the congress one relates to the influence of free convection in insulated vertical walls. The existence of such convection has been known for a long time.

The paper recorded a study of the convection in a number of walls insulated with different fibrous materials in different density. It was found that the effect was greatly influenced by the evenness of the distribution of the material. It was observed that with the same material loose fill insulation was less satisfactory than the same material in batt form.

With walls insulated with cork or foam plastic slabs important convection may occur due to the small slits and crevices between the individual slabs. General erection practice does not give sufficient protection against air currents. This is confirmed by observations of the ice distribution pattern found in old slab insulations of freezer rooms.

Short duration tests of insulated cold stores and of refrigerated ships were the subject of one of the contributions. The procedure is to observe the amount of refrigeration required to maintain a prescribed low temperature in the rooms with reference to the outside temperature. Fluctuations in the outside temperature influences the test results. In the paper the author considers the possibility of obtaining dependable figures even if the test is of limited duration and a graph is given to facilitate the procedure.

A paper entitled "Modification of load calculations required when using reflective insulation" deals with the calculation of the maximum heat flow rate for stores located in regions of extreme diurnal temperature variation. This is important in the case of structures where the insulation material has little heat storage capacity.

Records are presented showing the daily variation of heat transmission rates observed with various reflective insulated and conventionally insulated cold storage roof structures.

Another paper dealing with the same basic topic came from Prague and was entitled "Effect of solar radiation on heat transmission through insulated walls."

Besides conductivity tests attention is nowadays being directed to the measurement of water vapour transmission. One of the papers presented describes the technique for more accurately determining vapour transmissions for various temperature and humidity gradients.

Another paper described a graphic method for the determination of the vapour pressure within a wall and the mass rate of water vapour diffusing through walls consisting of several layers.

The conclusions one draws from a broad survey of the papers presented are: one, that more and more attention is being paid to reduction of the time taken in obtaining k-values in the testing of ships and transport vehicles, and two, the study of rigid foam insulators is of major importance.

THE COPENHAGEN PAPERS

Applications of Refrigeration to Foodstuffs

A Commentary by J. C. FIDLER, O.B.E., B.Sc., Ph.D.

THE preservation of food used to be the principal application of refrigeration machinery. During recent years, more plant has been sold for air-conditioning than for any other purpose, but applications for foodstuffs still hold their absolute values.

The fields of work of the commissions of the International Institute are such that application to foodstuffs is mainly the talk of the fourth commission, which discusses results of research and scientific principles, but other groups are also concerned. Commission V studies the commercial application, in cold stores and quick-freezing plants, and commissions VII and VIII are concerned with transport by land and sea.

One feature of the nevertheless very successful congress was that there were, if anything, too many papers. It was not easy to find one's way through the programme and to be sure one heard everything of interest. Thus, this article can do no more than indicate the broad divisions of the work, and spotlight some of the more interesting contributions.

So far as food is concerned, the congress got away to a flying start, with an address at the opening ceremony by Dr. Mogens Jul (Denmark) on the role of refrigeration in the world's food supply. This paper was brilliantly presented, and clearly understandable to the non-specialist. Dr. Jul discussed the statistics of production and utilization of food, and showed how, in the world as a whole, refrigeration still plays a very small part. We tend too often to forget the vast regions where distribution and preservation of foods are still primitive. In the more highly developed countries, more sophisticated foods and more complex methods are coming in, rapidly, all aimed at giving the housewife (with her increasing liability to work outside the home) less drudgery. The menace of the "TV. dinner" looms large, and the disappearance of the traditional kitchen is threatened. Orwell ousts Boillat-Savarin ! or does he ?

One publication, issued prior to the congress, which will be of major use to people who store foodstuffs, is the list of "Recommended conditions for cold storage of perishable foodstuffs" drawn up by commission IV. As with other lists of this sort, care is needed in applying the recommendations, having regard to origin of the food, but no previous list can have had such careful scrutiny by so many experts. Don't, please, look up values you need without reading the explanatory notes.

Turning to the papers themselves, and beginning with those on meat, Lorentzen (G) and Røsvik (Norway) presented results of work on a direct freezing of carcases immediately after slaughter. Loss of weight is reduced, and while the discussion left it doubtful if this gain was maintained in storage, the saving of a whole day during freezing must be commercially worthwhile. Another system, said to save time, was the freezer described by Korsgaard and Larsen (Denmark) in which much of the heat transfer was by radiation to direct-expansion plates between the carcases ; there is no air blast in the room. Rutov and Alekseyev (U.S.S.R.) gave a most useful summary of the accumulated experience of storage of frozen meat in the fully jacketed cold store No. 12 in Moscow. It was stressed that the divisions within the jacket must be reasonably well insulated (K. of 1·0) and that the temperature difference between the jacket and the store must be small ; if it exceeds 1° C., then frost will form on the inside of the partition, even if it is insulated.

Much time was devoted to assessments and maintenance of that ill-defined term "quality." Noskova & Peck (U.S.S.R.) propose to use the count of psychrophilic* bacteria as an index of spoilage of foodstuffs ; Barnes (U.K.) described an investigation of the source of psychrophilic bacteria on eviscerated poultry, and proved that the main source of infection is not the gut, but the feet and feathers, and that the danger points in the plant were the water supply and the slush ice tank. Work on spoilage of frozen produce has been bedevilled in the past by a belief that frozen goods spoil more rapidly on thawing than do fresh ; in a careful series of studies, Kitchell and Ingram (U.K.) could find no grounds for this belief, and they give valuable warnings of the need scrupulously to check experimental techniques.

It is regrettable that some of the papers on freezing of fish did not describe new processes ; much had been published previously, but the need to maintain low, and lower than at present used, temperatures during the freezing of fish cannot be overstressed nor too often said. This was the theme of Burgess and Cutting (U.K.), who showed that too many retail cabinets in the U.K. and U.S.A. operate above 5° F., leading to rapid loss of quality. A paper likely to be useful to those who trade in bulk frozen fish was that by Jason and Sanders (U.K.) on dielectric thawing. With precautions, theoretically possible hot-spots do not develop in practice.

On dairy produce, the only paper came from Wearmouth (U.K.) : This was a useful survey of modern trends ; the type of paper very suitable for a congress, where the need is to present a broad picture for the non-specialist.

Although gas storage of fruit is well established here, there are many problems still to be solved ; Tomkins (U.K.) described a simple small-scale method of obtaining gas storage conditions. Smock (U.S.A.) outlined the problems they had encountered in "controlled atmosphere" storage (Anglicé—"gas storage"), with particular reference to a scrubber which used water only, and not alkali, to absorb carbon dioxide. "C.A." storage is growing rapidly in the U.S.A. Smith (U.K.) described his work on the application of very high concentration of carbon dioxide, in the transport of precooled raspberries by rail and road, and the storage (at 34° to 40° F.) of blackcurrants.

A paper by Lentz and Phillips (Canada) on jacketed rooms for fruit and vegetables provoked a lively discussion (continued outside the congress buildings) on the relative merits of the jacket and the conventional system, adequately insulated and with adequate cooling surface, in maintaining high humidity, especially with produce which is evolving heat. The problem is not quite the same as that dealt with by Rutov (above). The argument continues. Living fruits suffer losses from physiological disorders ; one of these, superficial scald, was reviewed by Fidler (U.K.). New methods of control, especially chemical methods introduced by Smock, offer hope of elimination. An unusual paper was that by Ginsberg (S. Africa) on storage of chincherinchees, the increasingly popular long-living cut flower. The optimum temperature is 40° F., and the flowers should be packed in sealed polythene bags.

Naturally, there was much on quick-freezing of fruits and vegetables. A good summary paper was that by Meadows (U.K.).

The more recherché methods of preservation include freeze-drying. There is general agreement that this is costly, but it may be useful for what a charming East German lady described as "catastrophal accidents" and expeditions, or other non-normal activities. Three useful papers were given on this, mainly dealing with the difficult last phase of drying, the removal of water down to very low values. Authors were Gröschner *et al.* (E. Germany), Brockmann (U.S.A.), and Tchigeov (U.S.S.R.).

We are becoming conditioned to auxillary processes-radiation, antibiotics, etc., as aids to refrigeration ; the bogy of their replacing refrigeration seems to have vanished. Phillips (Canada) has reduced core flush in apples by gamma irradiation,

* *This only means that the bacteria can grow at low temperatures* !

and Brunelet and Vidal (France) showed pictures of successful work of the same type with strawberries, raspberries, apricots, morellos, peaches and tomatoes. The latter paper was an interesting example of the type of research carried out in France by a commercial cold storage company. Golovkin (U.S.S.R.) showed how useful ultra-violet radiation can be in preservation of foodstuffs, especially those of animal origin, and discussed the kinetics of the process. Another paper from the Entrepôts Frigorifiques Lyonnais, by Faure *et al*., was on the prolongation of storage life of meat by perfusion or spraying with aureomycin. The antibiotic is destroyed during cooking.

Prepackaging, as Dr. Jul had stressed, has come to stay. There were many contributions on the effect of plastic films as adjuncts to preservation. Lipovec (Yugoslavia) had improved storage results from chestnuts held at 0° C. in polvethylene-lined boxes. Weight loss was reduced, with attendant reduced loss of quality. Marcellin (France) and Leblond (France), who are colleagues, produced figures for the effect of plastic films on respiration of fruits, and on composition of the atmosphere inside the packages, and Leblond described ingenious containers in which panels of different plastics of different diffusion coefficients, were used to ensure the production and maintenance of correct gas storage conditions.

Prepackaging can extend "shelf-life," mainly because of the effect of the package on the internal atmosphere. Heiss (Germany) described the effect of changes in oxygen content, light intensity, and temperature, on a range of foodstuffs normally sold in self-service stores.

The effect of temperature on quality during distribution of quick-frozen fruits and vegetables, and the correlation between certain chemical and physical characteristics of these foods were described by Talburt and Beavens, and by Copley and Guadagni, both papers originating in the Western Regional Laboratories in the U.S.A., where the classical series of studies of effect of conditions of storage on quick-frozen produce has been carried out. Readers of the Refrigeration Research Foundation leaflets will be familiar with their work, and the efforts to make the retail trade temperature conscious. It is emphasized that all temperature effects are additive and irreversible.

Taste panels are used widely in work on assessment of quality, but it has been found that texture is something difficult to assess by this method. Love (U.K.) described a rapid method of assessing texture of fish, depending on light transmission through homogenized muscle suspended in dilute formalin; as toughness increases, fewer cells remain intact, and optical density increases. In the discussion, Slavin (U.S.A.) said he had used a method depending on optical density of the eye fluid, of haddock or whiting.

It is more difficult to predict storage life of live tissues than of frozen. Harvey (U.S.A.) has worked on forecasting storage life of grapes and apples, by keeping representative samples at high temperature. The method clearly is useful, but would break down with fruits liable to certain physiological troubles. Plank (Germany) reduced the dependence of storage life on temperature to a relatively simple mathematical expression. The discussion provoked a display of mathematical pyrotechnics from a Spaniard, and a warning from a British biologist about the limitations of the physical approach. The relation of storage life to temperature is not simple, and is not the same for all forms of injury which terminate life.

This summary would be incomplete without reference to transport of food, but the subject is too vast to deal with adequately in a summary. Papers to be noted for reading when the proceedings appear are those in the plenary session, by Christiansen (Denmark) on transport by sea, Pieffort (Interfrigo) on rail and road transport, Maurer (France) and Redit (U.S.A.) on transport by air, and a series of papers on transport of bananas by Gac (France), Deullin (France) and Merlin (France). An interesting feature of the discussion on these papers was the suggestion that the coefficient of heat transfer fruit/air in many cargo spaces is no higher than that to be expected by convection. How much do we know about movement of air ? Trends to cheapen transport and reduce wastage were outlined in papers by De Beaux (Australia) on bulk cargoes of apples, by Boyes (S. Africa) on the use of portable refrigeration units in cargo ships, and Cooper and by Bester (S. Africa) on disposable insulation and portable refrigeration. The latter two papers were concerned with striking reduction of wastage in S. African citrus carried under such a system, as compared to carriage in ventilated holds.

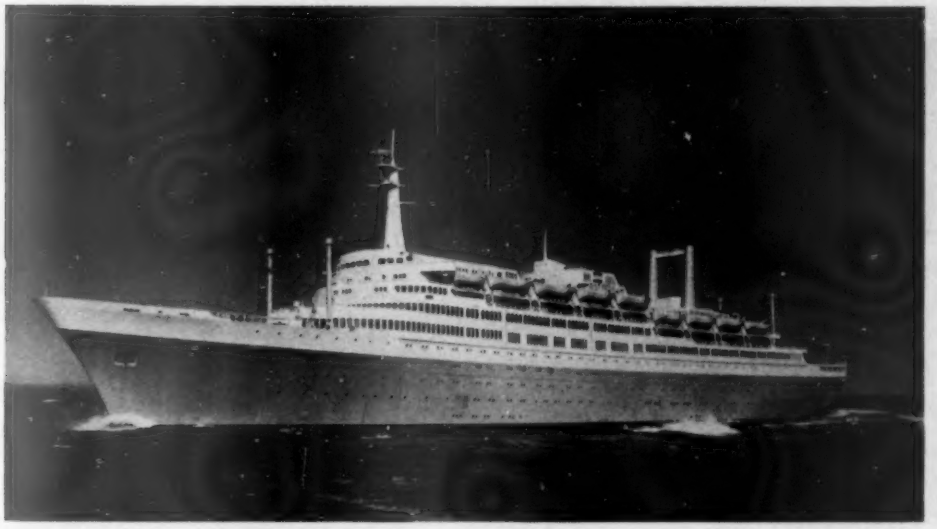
Whatever one's interest, there was something on it. If you didn't come this time, make a date for Germany, 11th Congress, 1963.

SOME LEADING CONGRESS COMMITTEE PERSONALITIES

Mrs. Lisen Meyer, chairman, associates' committee.

Professor S. A. Andersen, doyen of the Danish refrigeration field.

Mr. Mogens Lichtenberg, chairman, hospitality committee.



A view, taken during her technical trials of the new, fully air-conditioned, 38,000 (gross) tons flagship, s.s. "Rotterdam," of the Holland-America Line.

Fully-Air-Conditioned s.s. *Rotterdam*

ONE of the most interesting liners, from the design viewpoint, that it has been the pleasure of " M.R." to inspect since the war is the s.s. *Rotterdam* which last month took her place at the head of the Holland-America Line's fleet.

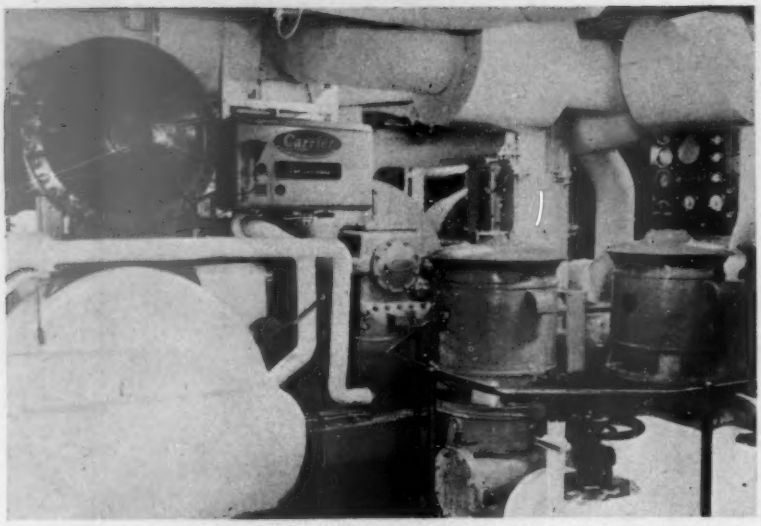
A profile startingly different from any other vessel in the western ocean traffic lanes was immediately apparent as she lay in Rotterdam Harbour, for she dispenses with the conventional funnel. The unique arrangement of her passenger accommodation is also a radical departure from traditional ship-planning and layout.

Some interesting statistics of this liner are:—

Length, overall, 748 ft.; Length, on waterline, 679 ft. 8 in.; Length, between perpendiculars, 650 ft.; Beam, moulded, 94 ft.; Depth, moulded to main deck, 54 ft. 6 in.; Gross registered tonnage, 38,650 (approx.); Displacement tonnage, 31,530 (approx.); Deadweight tonnage, ± 7,800; Propelling machinery—Twin screw double reduction geared triple expansion turbines; Shaft horsepower, 35,000; Speed, service, 20.5 knots; Total dry cargo, 102,000 c.ft.; Total cooled cargo, 14,000 c.ft.; Total passengers, 1,456; Total officers and crew, 776.

All passenger cabins and public spaces and all crew quarters in *Rotterdam* are fully air-conditioned. The conditioned air is supplied by 36 air-conditioning units in which the air is filtered, cooled and dehumidified, or in winter conditions is heated and humidified if necessary; cooled or heated water is pumped through the units by means of six pumps. In each cabin, temperature can be controlled by means of a thermostat which operates a reheat battery. It will be possible to maintain an average of 70° F. with an outside temperature of as low as 10° F. The conditioned air, which is cooled and dehumidified in summer or heated and humidified in winter, is led through an elaborate system of trunking to each cabin, public rooms and crew quarters. The 36 special ventilating-units for that purpose are installed throughout the ship. Air from bathrooms and lavatories is exhausted by 11 exhaust fans. For ventilating kitchens, laundry, stores, etc. 23 supply and 23 exhaust fans are installed. The above mentioned air-conditioning and ventilating units are installed in 61 fanrooms spread over the ship. There are nearly seven miles of trunking, the greater part of which is insulated with vapour-sealed glass fibre insulation.

In the stabilizer room three, steam-turbine driven Carrier " Freon " compressors of the centrifugal type are installed to handle the above cooling load. A total surface of 430,000 square feet of sprayed asbestos and of 140,000 square feet of glass fibre was applied as insulating material to give protection in case of fire, to insulate the air-conditioned rooms against heat and cold and to absorb noise. The maximum cooling capacity of the three compressors in 24 hours equals the capacity of 1,830 tons of melting ice. The exhaust steam of these turbines is



The compact Carrier air-conditioning equipment aboard "Rotterdam."

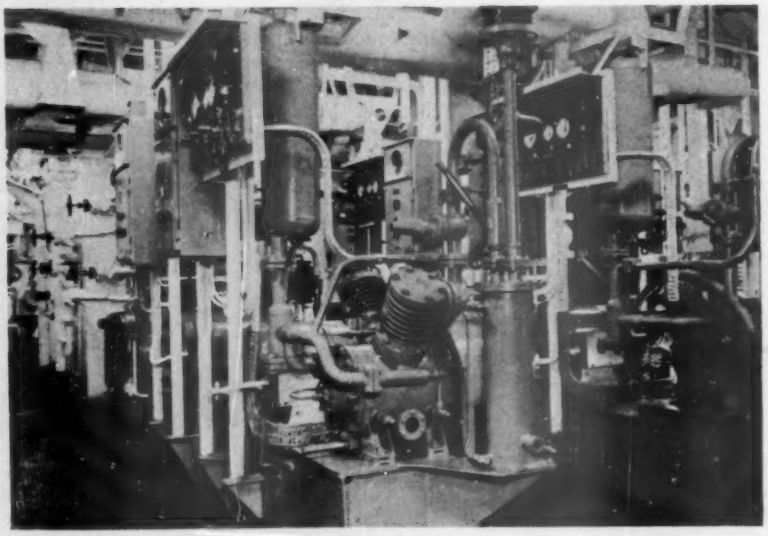
condensed in the distilling plants for producing fresh water.

The total refrigerated space for cargo and provisions is 45,350 cubic feet. More than 60 refrigerators, for storage of food and beverages, are placed in the kitchens and pantries throughout the ship. Of this capacity of 45,350 c.ft., about 14,000 c.ft. are set aside for cooled cargo, comprising two refrigerated cargo rooms placed in hold no. 2 and one refrigerated room in hold no. 3. A temperature of 15° F. can be maintained therein, but coolers and fans are also dimensioned for carrying fruit at temperatures above freezing.

The Grasso refrigerating machinery for the provisions and the cooled cargoholds forward is located in the most forward engineroom. The refrigerating machinery for cooled cargo in the aft portion of the ship is located in the shaft alley.

The machinery for propulsion, power plant and further auxiliaries are erected in six enginerooms which have a total length of about 300 ft. From aft to forward the six enginerooms are the following:—

Main engineroom, with shaft alley.
Boiler-room.
Evaporator-room.
Generator-room.
Air-conditioning and stabilizer room.
Refrigeration room.



The Grasso refrigerating plant.

The U.S. National Bureau of Standards has recently found that oxygen is efficiently converted to ozone in a microwave discharge near a cold surface. This method for the laboratory production of ozone is capable of 100 per cent. conversion under certain operating conditions.

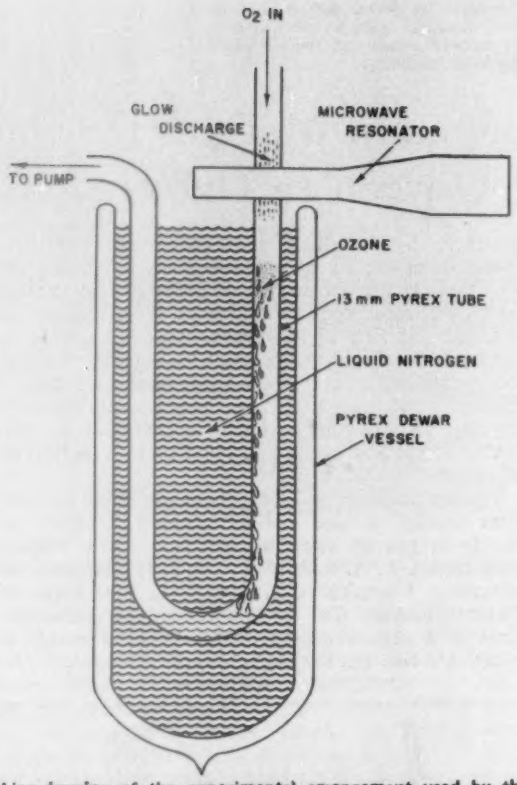
New, Low Temperature Production Method for the Efficient Conversion of Oxygen to Ozone

BASIC studies on trapped radicals conducted by the U.S. National Bureau of Standards resulted recently in the establishment of a new laboratory method for the efficient conversion of oxygen to ozone. The project has been sponsored by the U.S. Department of Defence.

The new process, which gives nearly 100 per cent. conversion under certain operating conditions, involves the electrical dissociation of oxygen in a microwave discharge near a surface cooled with liquid nitrogen. Not only is this a convenient method for producing ozone for laboratory use, but the possibility of commercially producing ozone in this way suggests that the expense which has to date limited its use can be considerably reduced.

Ozone (O_3) is an allotropic form of oxygen, having chemical properties similar to those of the usual form but more intense. For example, it is so strong an oxidizing agent that silver turns to silver oxide in its presence. This oxidizing effect makes ozone effective in purifying the air in public buildings, treating the water in municipal water supplies and swimming pools, and bleaching fabrics, starch, ivory and certain oils. In addition to these uses, various commercial processes are directly dependent upon ozone, such as the manufacture of artificial camphor and vanilla extract. In its liquid form ozone sometimes explodes for unknown reasons and should therefore be produced in small amounts and handled by experienced personnel.

The bureau's method for producing ozone resulted from studies of the *low temperature reactions of atomic oxygen* by guest workers in the free radical programme, R. A. Ruehrwein and J. W. Edwards, of Monsanto Chemical Co., and J. S. Hashman, of Callery Chemical Co. In this method oxygen is sent through a high-frequency electric discharge into a Pyrex U-tube immersed in liquid nitrogen. The



Line-drawing of the experimental arrangement used by the U.S. National Bureau of Standards to develop the new and highly efficient method for the production of ozone.

arrangement is such that a glow discharge occurs in the oxygen stream just above the liquid nitrogen level. Ozone is then produced as the dissociation products in this discharge condense on contact with the liquid-nitrogen-cooled surface. The liquid ozone, which forms in a narrow band on the wall of the U-tube a few millimetres below the glow discharge, drains slowly down the tube.

After unconverted oxygen is pumped off, the volume of the ozone yield at standard conditions of pressure and temperature can be calculated from the measured amount of liquid and its density. Comparing the yield with the volume of oxygen introduced into the system shows that 100 per cent. conversion is possible under certain conditions.

The conversion efficiency for this arrangement depends upon flow rates, reaching its maximum at rates of 5·7 c.c. per minute and lower. At such low flow rates all oxygen introduced into the system is converted so that pumping becomes unnecessary. However, much of the available energy is wasted at these rates, the energy efficiency being at its peak with much higher rates up to 360 c.c. per minute. Above this limit the 135 watts of microwave power available was not sufficient to maintain a stable glow discharge.

OBITUARY

Mr. E. Markham

ERNEST (Jerry) Markham was apprenticed to George Clarke & Co. Ltd., of Sunderland and during 1912-15 also attended, as a day scholar, the Sunderland Technical College from which he obtained the distinction of a Whitworth Exhibition.

During the 1914-18 war he served in the Navy as engineer-lieutenant and after its termination joined Peter Brotherhood Ltd., where he was for some years associated with Mr. H. M. Dunkerley on the refrigeration side of the firm's business; he presented a paper on "High revolution compressors for marine refrigeration" at the fourth International Congress of Refrigeration held in London in 1924.

Mr. Markham later acted as general sales representative for the firm in the North of England, being elected to the board as sales director in 1945. He was responsible for the reintroduction of the manufacture of refrigerating machinery that had fallen into abeyance during the war and is now mainly limited to the larger installations and those of a specialized character.

Undertaking a voyage to Norway as a business visit he was found dead in his cabin on the morning of the boat's arrival at Oslo, an untimely end to a striking career and colourful personality.

He is survived by his widow and two married daughters.

Mr. T. Laurie Price

We much regret to state that Mr. T. Laurie Price, head of the firm of engineering consultants of that name which for many years has been closely associated with the refrigeration industry, died recently. Some biographical notes on the late Mr. Price will appear next month.

Mr. W. A. Bennett

We record with much regret the passing recently of Mr. W. A. Bennett, chairman and managing director of Associated Fisheries Ltd. and chairman and managing director, among 46 other directorships, of the London Ice and Cold Storage Co. Ltd., and of the Grimsby Cold Storage Co. Ltd.

W. A. Bennett was 14 when he began work on Monday, September 8, 1908, for his father Mr. John Bennett, C.C., who owned a small business in Billingsgate Market. He rose from his bed at 3.30 in the morning to commence work at 5. Not long after the 1914-18 war, Mr. Bennett, now controlling the company, was joined by a young Scot who later became Sir David Robertson, M.P. for Caithness and Sutherland. Sir David was to become closely identified with the cold storage interests of the group. In October, 1957, W.A.B. "streamlined" the organization of the quick-frozen food sections of the group when three companies were brought together to form Eskimo Foods Ltd.

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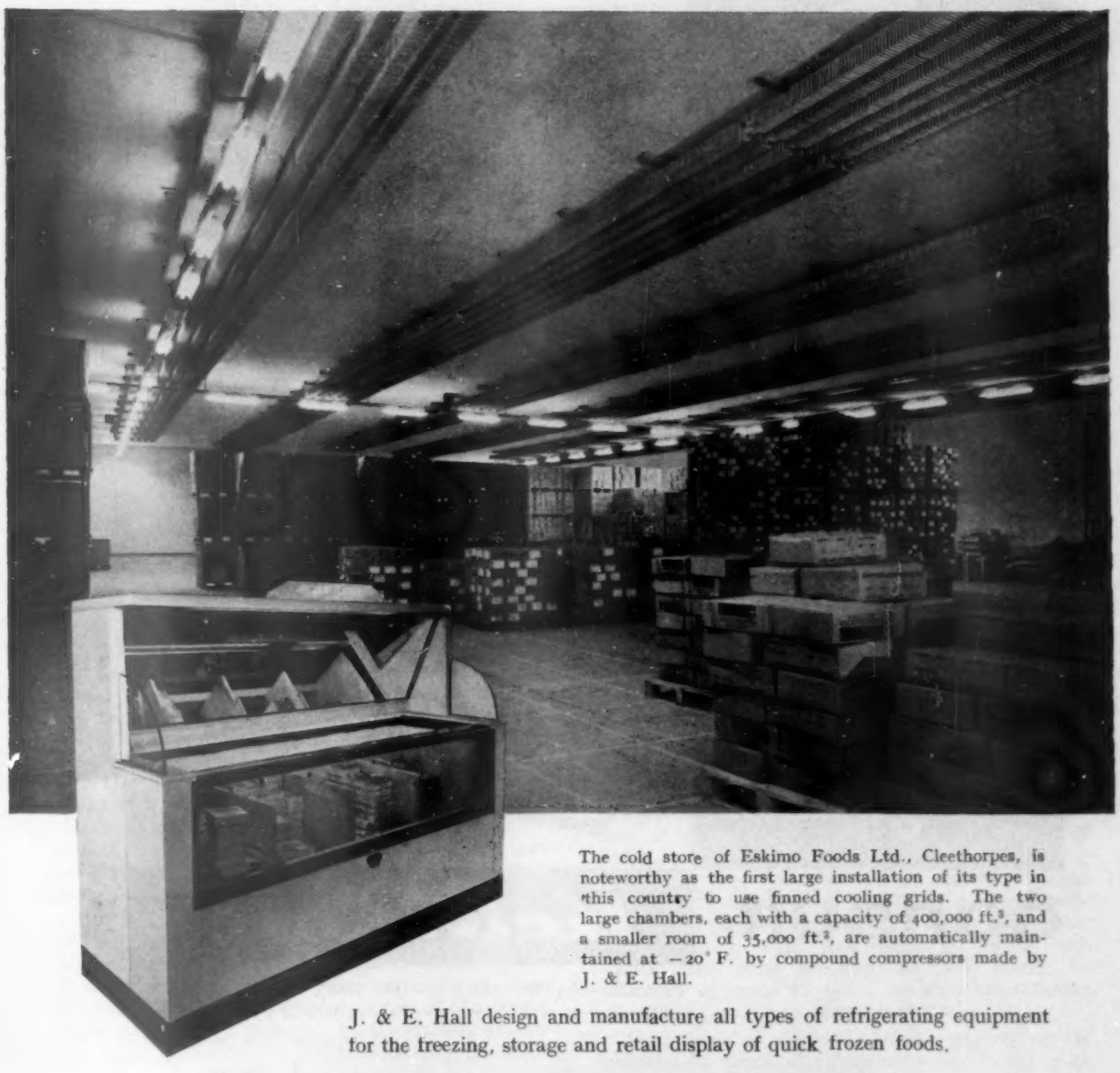

The cold store of Eskimo Foods Ltd., Cleethorpes, is noteworthy as the first large installation of its type in this country to use finned cooling grids. The two large chambers, each with a capacity of 400,000 ft.³, and a smaller room of 35,000 ft.³, are automatically maintained at −20° F. by compound compressors made by J. & E. Hall.

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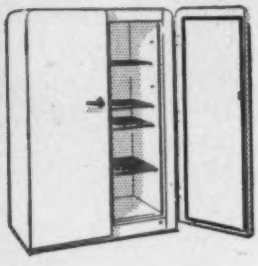
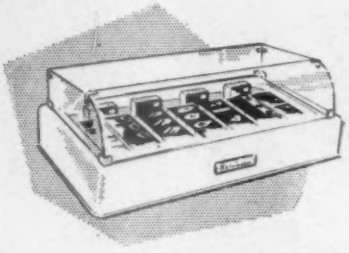
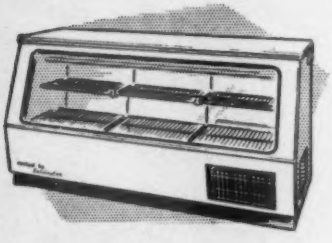
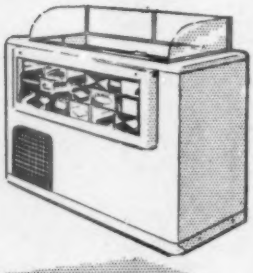
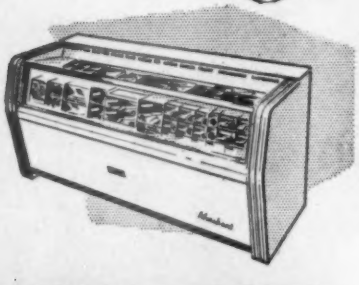
These are some examples taken from the finest range of commercial refrigeration equipment in the world, backed by a nation-wide sales and after-sales service.











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M.R.1

Automatic Refrigeration*

A New Volume of Outstanding Importance

THE author of this book is Professor of Refrigeration at The Technical University of Denmark and, as may be expected, deals with the present state of progress in the art in Europe.

The book covers a lot more ground than might have been expected from its title but the author is so enthusiastic and so good at sustaining our interest that before we have read more than the first few pages we feel we are beginning a story which we must see through to the end.

Before we are allowed to consider automatic refrigerating plants as such we have been taken through a complete refresher course on refrigeration and air-conditioning and found the trip entirely enjoyable. Then we are shown something of the gear and methods of control with discussions on basic principles of detection, differentials, transmission, etc., followed by illustrations and full descriptions of such things as thermostats, expansion valves, automatic oil separators, solenoid valves, etc., of standard design as commonly used in automatic plants, not forgetting the electrical equipment.

Chapter 4 is headed "Automatic refrigerating plants," and occupies over a hundred pages largely devoted to examples of the application of automatic refrigeration with numerous very good photographs. The problems to be tackled in such installations are competently dealt with and particular stress is put on the importance of correct humidity in freezing rooms and cold stores for meat and food products in general. Dairies, margarine, ice-cream, ice-making and locker plants, "domestics," chocolate cooling, marine refrigeration, refrigeration on wheels and in the chemical industry are among the subjects dealt with, all well illustrated and with little bits of unexpected information making it imperative not to skip for fear of missing something. The author remarks that there remain many more applications but the scope of the book does not permit of mentioning more than a few.

We next come to "Operation of automatic refrigerating plants," and the question of frost formation on cold surfaces; methods of defrosting are dealt with at some length. Here again, though most of this is common knowledge, some of the points made give food for thought. It was pleasing to note that in the little marginal sketch illustrating the water spray defrosting system the sparge pipes are slightly inclined so as to drain back out of the refrigerated space when the water is turned off and a little drain pipe was provided from the supply side to the drain to complete the process. A simple matter of course, but it serves to indicate the care taken in the preparation of this work. The hot brine defrosting of grid coils in a ship's hold is included but we feel not quite relevant or likely to be automatically operated. A description of wet air coolers is included as being immune from frosting up so long as the brine concentration is kept right and the author has quite a bit to say on this point and the various brines in use. This section also deals with fluctuating loads and hunting problems, insulation and vapour sealing barriers with a display of mathematics on the subject relieved near the end by a nice little tip about avoiding "cold bridges" from inside to outside of a cold room. The practical man will appreciate this and he may also get a smile out of some poor spelling just here which will no doubt be corrected in future editions.

To many perhaps the most important part of the book comes near the end, chapter 6, "Calculation sheets" and chapter 7, "Tables and diagrams." Between them they occupy nearly 300 pages and there is a supplement of "diagrams" giving the vapour characteristics of all the usual refrigerants. The usual tables giving characteristics at saturation are not included in the diagrams, but given separately, and it would appear that makes for simplification besides keeping the diagrams within limits.

The calculation sheets are divided into twelve main groups covering practically the whole range of refrigeration calculations. The engineer will find some new tools among them and some may not agree with one or two of the author's conclusions. All the same, the man who has been in the habit of designing installations and machines from data which he has gathered from various sources and from experience of existing plants will welcome the chance of checking up with the methods advised by such a good authority. At the end of the last section dealing with the layout of a plant for cooling freshly slaughtered pigs, and which by the way would appear to be open to some questioning, the author says "Experience from practical life will always be necessary in order to get a satisfactorily working plant," and we can wholeheartedly agree.

As a work of reference for the student or the engineer the tables and diagrams alone would make the book invaluable as much of the information is of the type which has previously been found only in the foreign press and in many and various publications. Along with this the patient and charming way in which the author ensures that his readers understand what he wants to put over is certain to please all who are in any way connected with refrigeration or who want to know more about it and, in particular, its modern development.

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* *Automatic Refrigeration* by S. A. Andersen. 650 pp., 9¾ in. × 7 in., 311 line drawings, 170 half-tone illustrations, 51 coloured illustrations and 34 refrigeration charts. English edition published by Maclaren & Sons Ltd., 131, Great Suffolk Street, London, S.E.1, on behalf of Danfoss, Denmark. Messrs. Maclaren are sole agents for this book in the British Commonwealth and the U.S.A. Price 85/-.

The Institute of Refrigeration Bulletin

INSTITUTE COMMITTEES, 1959-60

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LIGHTFOOT MEDAL

On the recommendation of the papers committee, the executive council has decided to award the Lightfoot Medal for the best paper presented during the 1958–9 session to Dr. H. J. Goldsmid, B.SC., for his paper entitled "Thermoelectric cooling," which he read at the meeting of the Institute held on February 5, 1959.

FULL-TIME COURSES IN REFRIGERATION, 1959-60

Enrolment for the full-time courses in refrigeration at the National College for Heating, Ventilating, Refrigeration and Fan Engineering, Borough Polytechnic, Borough Road, London, S.E.1, is now in progress. Applications should be submitted without delay to the clerk of the governors of the college, from whom forms of application and syllabus booklets may be obtained. The courses commence on September 28, 1959, and end on July 8, 1960.

Institute members will remember that these courses were established in order to meet the needs of the industry by providing the necessary specialized educational facilities in refrigeration and allied subjects. The supply of trained refrigerating engineers in the future depends on full use being made of these facilities and it is, therefore, sincerely hoped that those members of the Institute concerned with staff training will release as many suitably qualified younger members of their staffs as possible for the period of the course. The advantages which will ultimately accrue to the industry by firms being far-sighted enough to release young men to attend these National College courses, at a stage when they most readily absorb knowledge, will be obvious to those with the interests of the industry at heart. The fees for the courses are very moderate and, in many cases, may be covered by grants or scholarships.

Diploma Courses in Refrigeration

The diploma courses are primarily intended for apprentices who have already qualified for their ordinary national certificate in mechanical engineering (including applied heat or heat and heat engines), which will have required three years of part-time day or evening class study at a technical college. The majority of students have this background and are released by their employers for the diploma course. Applications for admission to the diploma courses will also be considered from students with other qualifications if these are equivalent to the ordinary national certificate in mechanical engineering.

The British Refrigeration Association which, like the Institute, has representatives on the board of governors of the college, actively co-operates with the college in assisting and encouraging member firms to release students to attend the college.

In certain cases, students attending diploma courses may obtain Government or county council grants and scholarships towards fees and maintenance during the necessary period.

Associateship Courses

The course of study laid down for candidates for the associateship of the college consists partly of advanced instruction in one of the three technologies catered for at the college and partly of training in research. About half of the available time is allocated to research, which may take the form of theoretical or experimental studies or the development of new designs. The candidate is expected to submit a thesis describing his researches which should show his ability to contribute to new knowledge. He will also be required to show satisfactory progress in his class work.

Deferment from National Service

Following negotiations between the Institute and the Ministry of Labour and National Service, in co-operation with the British Refrigeration Association and the National College, there is usually no difficulty in obtaining deferment for students, released for one year from the industry, provided that they are studying to obtain a recognized professional qualification. Candidates who are successful in the diploma examination in refrigeration satisfy the examination requirements of the Institute and thus the conditions for deferment are usually

met. Students are, however, advised to join the Institute as student members, and the secretary will be glad to advise in particular cases.

Fees

The college fees for diploma and associateship courses, applicable to United Kingdom residents, are £50 and £60 per annum respectively, in addition to which there are small charges for college membership and as laboratory deposits.

College Hostel

An additional facility available is the National College hostel at Dulwich. Accommodation is provided at moderate charges, and applications for residence should be made at the same time as enrolment for the course.

Syllabuses

Full details of the subjects covered are given in the college syllabus booklet, referred to above.

EVENING CLASSES IN REFRIGERATION, 1959-60

Evening classes in refrigeration will shortly be commencing at technical colleges in various parts of the country. These classes cover two distinct courses of study. One of the courses, that for the City and Guilds of London Institute syllabus no. 73, in the science and technology of refrigeration, is intended for the student who wishes to obtain a professional qualification and to qualify for corporate membership of the Institute ; certain pre-entry qualifications are required by persons enrolling for this course. The other course, for the City and Guilds syllabus no. 72, in refrigeration practice, is primarily designed for students who desire to become qualified as refrigeration servicemen.

The Science and Technology of Refrigeration

Evening classes in the science and technology of refrigeration will commence at the National College for Heating, Ventilating, Refrigeration and Fan Engineering, Borough Polytechnic, Borough Road, London, S.E.1, towards the end of September. The course, which extends for two years, is in preparation for the City and Guilds of London Institute syllabus no. 73, which is the examination for corporate membership of the Institute of Refrigeration. Intending students must be over 21 years of age and should hold the ordinary national certificate in mechanical engineering (including applied heat or heat and heat engines) or an equivalent qualification.

Enrolment

The college will be open from 5.30 to 8 on the evenings of September 21 and 22 for the enrolment of students for evening courses. The director and members of the staff will be present on each evening to advise students on suitable courses of instruction. The fee for students residing within the administrative County of London and most of the adjoining counties is £2 10s. for an evening course consisting of two or three evenings a week. In some cases, students who reside outside the administrative County of London will be required to furnish vouchers from their local education authority. Particulars may be obtained on application to the secretary of the college. The governors require all part-time students to pay a fee of 1s. 6d. a year for membership of the Borough Polytechnic.

Refrigeration Practice

It is believed that courses in Refrigeration Practice, in preparation for the City and Guilds of London Institute syllabus no. 72, are to be held at the following colleges :—

Stretford Technical College.
Stowe College, Glasgow.
Preston Technical Institute, Brighton.
Willesden Technical College, Middlesex.
Hastings Technical College.
Reading Technical College.
Llandaff Technical College.

Enquiries concerning these courses should be made to the principals of the colleges.

It is possible that courses would be arranged at other technical colleges provided there was sufficient local demand.

BRITISH STANDARDS

Electrical refrigerators and food freezers for household use (B.S. 922 and 1691 : 1959)

Two British Standards for electric refrigerators and food freezers are now streamlined into one new and revised publication. They are B.S. 922 (requirements for all climates) and B.S. 1691 (for temperate climates only). Two upper limits of test temperature, 90° F. for temperate climates and 110° F. for all climates, are now specified in the combined version.

Up-to-date design practice and the latest refrigeration techniques are embodied in this revision ; refrigerators or food freezers built to its provisions should thus have a high standard of performance and be of consistent good quality. Advantage has also been taken in the revision to limit the permissible refrigerants to those known to be satisfactory and general use. Some alterations have been made to the methods of computation of shelf area and storage volumes.

Construction of both the cabinet and the refrigerating system is specified ; and detailed requirements for the electrical components are given. There are production tests for each appliance, as well as certain type tests for assessing performance.

Copies of this standard may be obtained from the British Standards Institution, sales branch, 2, Park Street, London, W.1. Price 7s. 6d. (Postage will be charged extra to non-subscribers.)

Rating and testing of refrigeration compressors (B.S. 3122 : 1959)

This new publication relates to the methods whereby refrigeration compressors are rated for performance and tested for rating.

The standard specified and described four primary methods of test and five confirming tests which must be employed in assessing the performance of a compressor. The rating is taken as the performance during the selected primary test and is not published unless the selected confirming test falls within the allowable limits. Both tests are run concurrently.

The primary and secondary tests are required to be conducted under specified test conditions both inside and outside the compressor, and provisions are made to ensure that reproducibility of results is practicable. Standard methods for the determination of ratings will ensure that purchasers of compressors, particularly of those intended for the larger installations, have a satisfactory comparative basis for, say, the assessment of tenders.

The test conditions within the compressor are expected to be as near as practicable to those required by the selected group of application conditions, so that, when manufacturers publish their ratings under the terms of this standard, the purchaser will be provided with the information necessary to guide him in the selection of a compressor to meet his requirements.

B.S. 3122, Rating and testing of refrigeration compressors, may be obtained from the sales branch, British Standards Institution, 2, Park Street, London, W.1. Price 7s. 6d. (Postage will be charged extra to non-subscribers.)

ACOUSTICAL INVESTIGATION AND RESEARCH ORGANIZATION LIMITED

THE new research laboratories of the Acoustical Investigation and Research Organization Limited will shortly be completed at Hemel Hemstead, Hertfordshire, and will be the first independent non-trading and commercially available research station in this country for the purpose of practical investigations and research into all aspects of the problem of noise.

The aim of the organization is to foster and make known the basic principles of acoustic engineering and to encourage their application as a first essential at every stage of structural planning or mechanical design.

The services of the organization, which are available on a consultative basis, are designed to meet the specific needs of the architectural and other professions and those of industry and commerce in general.

Enquiries concerning the organization should be addressed to the chief acoustical engineer, Acoustical Investigation and Research Organization Limited, 118, Cromwell Road, London, S.W.7.

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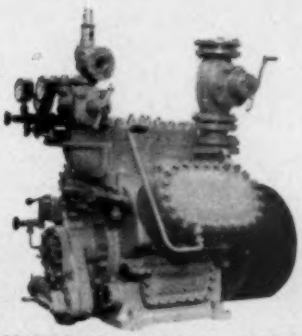
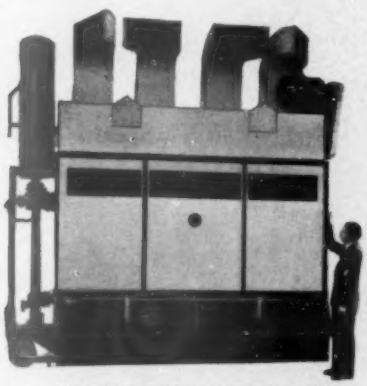


MODEL A.56 AMMONIA COMPRESSOR



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Until a few years ago there was very little that doctors could do for certain critically ill patients—severe head injuries, 'blue babies', tumours of the heart and brain. These cases needed a delicate operation. But until a way could be found to increase the chances of survival by reducing the brain's need for oxygen, it was impossible to attempt an operation.

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The doctors who tackled this problem knew that all body needs were slowed down by cold. A reduction in the patient's temperature would reduce his need for oxygen. If this could be done, it would be possible to cut off the blood supply to the brain long enough for the surgeon to perform the necessary operation.

This technique of cooling the patient is known as hypothermia.

THE PRESTCOLD HYPOTHERMIA UNIT

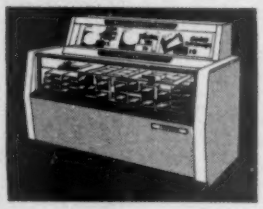
Prestcold developed an entirely new unit to meet the needs. The patient's temperature must be reduced smoothly and raised again, perhaps urgently. So he is enclosed in a special blanket which operates under precise thermostatic control. The Prestcold Hypothermia Unit has already helped doctors save lives by operations which a few years ago would have been impossible.

HOW PRESTCOLD CAN HELP YOU

Intense research, close attention to detail, experienced engineering—these qualities go into every Prestcold job, into the standard refrigerators and frozen food cases as well as into equipment made to meet a special need.

THE PRESTCOLD FARMOOR is full of fresh ideas. It has a multi-glazed display window; 11.1 cubic feet selling space for over 700 packets of frozen food; and a fully automatic complete defrosting system. The whole refrigerator is guaranteed for one year, its Super Presmetic Motor Compressor for five.

Ask your Prestcold distributor, or Prestcold Commercial Sales Department, Cowley, Oxford, for more details now.



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COLD STORE CONSTRUCTION

New method cuts building time by several months

New techniques in the construction of cold stores have ushered in a period of lower costs per cubic foot and, most certainly, considerably shorter building times. The accompanying pictures, taken during the construction of a Birds Eye store at Liverpool by Smiths Insulations Limited of Burton - on - Trent, emphasize the tremendous speed with which these premises were erected. The site was prepared on April 8th, 1959, and work proceeded so quickly that, as the bottom right-hand picture shows, the store was virtually complete by June 17th, 1959.

A German Maker of Thermostats

THE premises of Metzenauer and Jung—one of Germany's biggest concerns making thermostats—are situated in the town with the overhead mono-railway—Wuppertal.

The story of the development of Metzenauer and Jung is an outstanding example of the immense opportunities offered by modern technology to foreseeing and practical men. Four factories with over 2,000 employees constitute one of the biggest and most modern switchgear firms in Europe. Thirty technical offices abroad, linked to warehouses in Western Germany and a network of technical agencies in the most important towns in the export markets, enable rapid deliveries to clients in all parts of the world. This represents a wonderfully rapid development in less than three decades and it is interesting to find that both founders are still at the head of the undertaking.

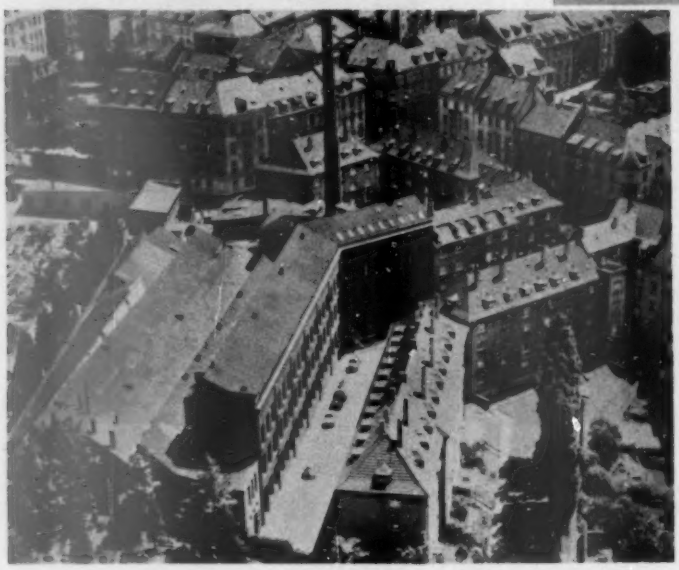
Metzenauer and Jung is the only firm in Germany which from its very beginning in 1925 specialized exclusively in the manufacture of automatic switchgear—a very considerable risk at a time when the concepts of automation and rationalization were still completely unknown to most experts.

The first real success was won in 1926. After a long period of research in the I.G.F. (German Dyestuffs Corporation), Bayer division, the still youthful firm of Metzenauer and Jung succeeded in producing the first completely automatic refrigeration plant. The whole of the German cold storage industry showed exceptional interest in this development. The firm was soon in a position to supply its products to not only German firms but to all important European refrigeration plant factories. In addition it soon succeeded in gaining a foothold in all branches of industry.

To-day Metzenauer and Jung supply not only refrigerating apparatus for refrigerators, glass display cabinets and automatic controls for cold storage plant but they also specialize in apparatus and switchgear equipment for complete automation in manufacturing concerns of every kind. Fanal switchgears are amongst the most popular low-tension switchgears in the whole of the European market.

The production of thermostats is divided into production lines according to the finished product. Apparatus for light industry and heavier industry is manufactured on different conveyer belts from the mass produced Fanal-capillary tube

Above: The firm's administrative offices on the "German Circular," erected 1955.



Left: Aerial photograph of factory 4 in Wuppertal-Elberfeld. In this factory Metzenauer and Jung manufactures all kinds of switchgear for the cold storage industry.

Air-break contactors up to 80 kW for heaviest duty.

Switch cabinets and switch desks for the control of production machines.

Push-button switches, with built-in pilot lamp, selector switch, locking device etc.

Regulating valves, cooling-water controls, solenoid valves.

For the Refrigeration Industry: Thermostats, pressostats, pressure switches.

Manually operated motor switches for flush and surface mounting.

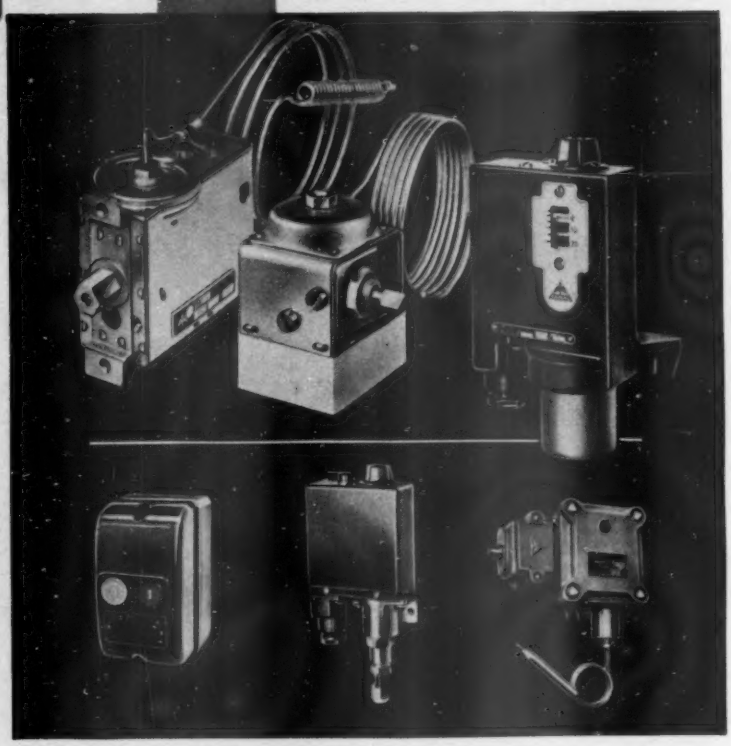
Oil-immersed contactors up to 500 amps, and contactor combinations.

Steel and cast-iron cased distribution systems. Solid, heavy industrial design.

Limit switches and float switches robust, steel or cast-iron cased models.

Explosion-proof switchgear: contactors, push-buttons, valves, etc.

Explosion-proof control units.



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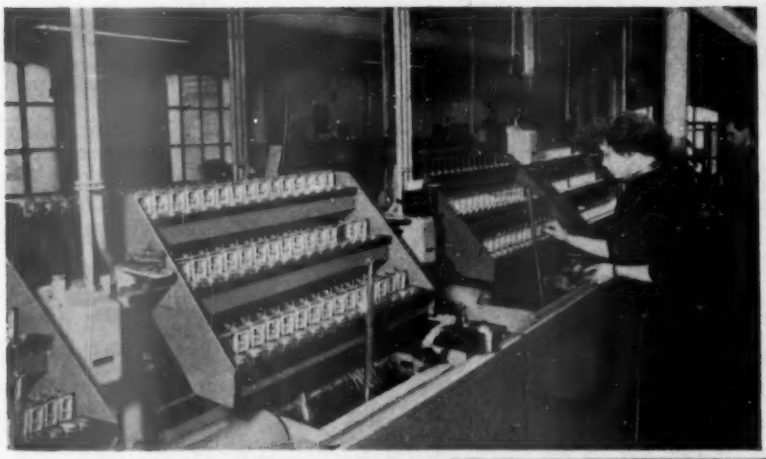

Left: The installation and testing of thermostatic controls take place at many ranges of temperature at different testing benches.

Right: In close co-operation with scientists and research departments of the most varied industries, the laboratory of Metzenauer and Jung carries out all projects for the scientific manufacture of efficient and strong switchgear.

Below: A conveyer belt along which pass 3,000 refrigerator thermostats a day.

thermostats for refrigerators, shop display cabinets, storage cabinets and the cold storage of beverages. Over 2,000,000 refrigerator thermostats had been sold up to October 1958. For many years the production of Fanal thermostats has led the field in Germany. Every 10 seconds a thermostat leaves the production lines of the Wuppertal factory.

Metzenauer and Jung was the first German firm to equip its thermostats with a self-adjusting level diaphragm and was able to secure a lasting success with that product. Moreover, the great care which is taken in the manufacture has also been of considerable help in that respect.

The testing benches are provided with electronic thermometers and are able—since each bench has its own refrigerating machine—to reduce the temperature to –50° C. in the shortest possible time. Just as surprisingly quickly the temperature can be restored again through transformer control.

The ultimate success of the installation of apparatus which lives up to its merited reputation is also due to the expert personnel thoroughly experienced in several models. Every eighth employee is engaged in a supervisory capacity ; in that way complete operational reliability is ensured.

The emptying of the capillary tube is controlled by an electric vacuum-meter. Delicate electric fields keep constant the pressure of the filling. The duration of life of the diaphragm and the snap switch amount to more than 1,000,000 operations so, to all intents and purposes, it may be considered unlimited.

Modern mass production of refrigeration equipment offers big advantages to every manufacturer and from the experience of Metzenauer and Jung it is apparent that the manufacturers for the cold storage industry have clearly been aware of the additional reliability offered by the mass production of well-known and well-tried apparatus.

ABSTRACTS FROM I.I.R. CONGRESS PAPERS

(continued from August issue)

COMMISSION 1

SCIENTIFIC PROBLEMS OF LOW TEMPERATURE PHYSICS AND THERMODYNAMICS INDUSTRIES USING VERY LOW TEMPERATURES, RARE GASES

Industrial problems in connexion with liquefaction and distillation of gases

A single column plant with expansion turbine for producing pure nitrogen under pressure. S. BEASLEY, M. RUHEMANN, W. L. SCDDON. *Manchester (United-Kingdom).*

To deliver continuously 350 m³/hr. of pure nitrogen at 8 atms. abs. to a chemical plant, without risk of fouling during compression, a single column unit has been designed and constructed embodying certain novel features.

Method of thermodynamic analysis for the fractionation, at low temperatures, of binary mixtures. B. M. BRODYANSKY. *Institut d'Energetique, Moscou (U.R.S.S.).*

Improvement of fractionating processes should be approached from a study of the energy transformations in the different parts of the plants and the losses occuring thereon.

Low-temperature expansion turbines. V. I. EPIPHANOVA. *U.S.S.R. Scientific Research Institute of Oxygen Machine-Building, Moscow (U.S.S.R.).* J. B. GARDNER and W. M. NICOL. *British Oxygen Research.*

The development of oxygen machine-building for the construction of large installations for the production of oxygen gas is indissolubly connected with the creation of a reliable and simple design of a low-temperature expansion turbine with a high coefficient of performance.

Application of electronic computer to distillation calculations for low temperature air separation plant columns. J. B. GARDNER and W. M. NICOL. *British Oxygen Research and Development Limited, London (United Kingdom).*

The use of an electronic computer for such calculations is described, enabling a considerable reduction in the time to be achieved for a particular investigation, and detailed studies of the effect of variables to be readily made.

Thermodynamic irreversibility in low temperature air distillation columns. J. B. GARDNER and K. C. SMITH. *British Oxygen Research and Development Limited, London (United-Kingdom).*

The thermodynamic irreversibilities occurring in such distillation columns due to fundamental factors and also to design factors are analysed and discussed and the energy penalties arising from them considered.

One-flow cascade cycle. A. P. KLEEMENKO. *C.T.S., Kiev (U.S.S.R.).*

A refrigerating cycle has been developed (and investigated) by the author in the gas liquefaction and separation laboratory of the Institute for Gas Research of the Academy of Sciences of the Ukrainian S.S.R. This process named "the one flow cascade cycle" has the thermodynamic advantages of the Pictet cascade cycle and is characterized by the constructive simplicity of the Linde cycle as well.

The main trends in the designing of large gaseous oxygen plants. Sh. KOBOULACHVILI. *VNIKhI, Moscow (U.S.S.R.).*

As a result of extensive research and experimental work carried out at VNIIKiMash a number of plants have been constructed with capacities of from 3,600 to 15,000 m³/hr. of gaseous oxygen.

Low temperature plants for argon purification. P. M. SCHUFTAN and T. J. WEBSTER. *British Oxygen Co., Ltd., London (United-Kingdom).*

A process developed and established by the British Oxygen Company for the purification of crude argon by application of low temperatures is described.

A method for efficiently providing low temperature liquids and apparatus on a large scale to an accelerated experimental programme. A. K. STOBER. *National Bureau of Standards, Washington (U.S.A.).*

This is a discussion of the problems involved in the provision of services, facilities and apparatus for use at low temperatures (1° K to 77° K) to a large number of scientists (30) who are working on an accelerated programme.

Some problems in the design of helium liquefiers based on the Joule-Thomson effect. D. H. PARKINSON. *Royal Radar Establishment, Great Malvern (United-Kingdom).*

The use of an "anti splash coil" in the heat exchange system of liquid hydrogen pre-cooling baths can prevent the spray being carried away and also enables the helium to be cooled to near the triple point of hydrogen effectively.

Equation of state of mixtures ; fluid under high pressure ; transport phenomena in gases, liquid and solid

P-V-T measurements of liquid He^3. F. J. EDESKUTY and R. H. SHERMAN. *Los Alamos (U.S.A.).*

The liquid range P-V-T of He^3 has been carefully examined from the melting curve to the saturation curve and from 1·0° K to 3·3° K.

On the inversion curve at low temperatures and the theorem of corresponding states. W. KOEPPE. *Berlin (Germany).*

By general thermodynamic considerations the inversion curve can be shown not to intersect the vapour pressure curve as was stated by Rowlinson but to end on the latter curve at a certain temperature $T_d < T_k$ (T_k is the critical temperature). At temperatures below T_d the vapour pressure curve can be regarded as a kind of prolongation of the inversion curve.

The equation of state of a fluid. J. L. LEBOWITZ. *Stevens Institute of Technology Hoboken, New Jersey.* H. L. FRISCH and H. REISS. *Bell Telephone Laboratories, Murray Hill, New Jersey (U.S.A.).*

The work required to form a cavity in a fluid is intimately related to its equation of state. This work is also related to the probability of finding such a cavity at equilibrium. For a fluid consisting of molecules possessing an impenetrable core this probability is known for sufficiently small cavities.

Diffusion and relaxation in He^3 to 0·5° K. H. A. REICH and R. L. GARWIN. *New-York (U.S.A.).*

The AA have extended their measurements of diffusion constant D and spin relaxation time T_1 to 0·5° K by use of a He^3 refrigerator in pure He^3 and in dilute solutions of He^3 in He^4.

Heat transfer in superfluid helium. L. RINDERER and F. HAENSSLER. *Universite de Lausanne (Switzerland).*

The heat transfer coefficient has been measured in He II for differences ΔT of temperature up to 1·800° K.

On the viscosity and second virial coefficient of a polar gas. J. R. SUTTON. *Mechanical Engineering Research Laboratory, Glasgow (United-Kingdom).*

A method of calculating the coefficient of viscosity of a polar gas at low and moderate temperatures is described. The gas is treated as a hypothetical mixture with three intermolecular potentials.

On the viscosity of He^3-He^4 mixtures in the liquid helium II region. Helium film flow in equilibrium with those mixtures. K. W. TACONIS, C. J. N. van den MEYDENBERG and F. A. STAAS. *Kamerlingh Onnes Laboratory, Leiden (Netherlands).*

The viscosity of mixtures of He^3 and He^4 was measured in the helium II region using the capillary flow viscosimeter. The results are compared with those determined by Wansink in very narrow slits and those derived from oscillating disc experiments by Dash and Taylor.

* *The proceedings containing these papers will be obtainable from the Hon. Secretary, I.I.R. in the U.K. at 131, Great Suffolk Street, London, S.E.1.*

Equation of state and transport properties of gases. A. VAN ITTERBEEK, J. J. M. BEENAKKER and J. M. J. COREMANS. *Leiden (The Netherlands).*

A survey of recent Leiden work.

Preliminary measurements on the density of liquefied gases under high pressure. A VAN ITTERBEEK, W. VAN DAEL and O. VERBEYE. *Instituut voor Lage Temperaturen en Technische Fysica, Louvain (Belgium).*

Measurements were made to determine the density of liquid oxygen as a function of pressure till 150 kg/cm² at a temperature of 90·2° K.

Mechanical properties of metals at low temperatures

Low temperature internal friction in metals at kilocycle frequencies. A. J. FILMER, T. S. HUTCHISON and D. H. ROGERS. *Royal Military College of Canada, Kingston (Canada).*

Measurements at kilocycle frequencies of the internal friction of annealed polycrystalline Al as a function of strain amplitude have been made at temperatures between 4° K and 273° K.

Some experiments on the alkali metals at low temperatures. D. HULL. *A.E.R.E., Harwell* and H. M. ROSENBERG. *Clarendon Laboratory, Oxford (United-Kingdom).*

Tensile tests on Li, Na and K at temperatures down to 4·2° K show that considerable hardening takes place in Li and Na which is associated with the low temperature martensitic transformation which occurs in these metals.

Dynamic mechanical properties of polymers at low temperatures. R. D. MCCAMMON. *Pennsylvannia (U.S.A.).*

A description is given of an apparatus which can be used to measure the internal friction of solids in the audio frequency range from liquid helium temperatures to 300° K.

The effect of annealing on the internal friction of copper. N. H. NIBLETT and J. WILKS. *Clarendon Laboratory, Oxford (United-Kingdom).*

A large maximum, the so-called Bordoni peak, is observed in the internal friction of cold-worked copper at a temperature of about 80° K. Measurements made on polycrystalline specimens cold worked 5 per cent. and then subjected to anneals at progressively higher temperatures show that the peak disappears in more than one stage.

Plasticity and fracture of ferritic iron at liquid nitrogen temperature. A. W. SLEESWIJK. *Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).*

Experiments in which some plastic deformation occurs prior to fracture might give a check on some of the hypotheses put forward. Armco ingor iron at liquid nitrogen temperature shows the characteristics for this type of experiment. At this temperature fracture occurs after several per cent of plastic strain before any constriction is formed in the specimen, and the fracture surface has a crystalline appearance characteristic of a " brittle " fracture.

Thermometry

New gas-thermometer measurements over the range from 10 to 90° K and the extension of the international temperature scale below 90° K. C. R. BARBER. *National Physical Laboratory, Teddington (United-Kingdom).*

A helium constant volume gas thermometer is in use at the National Physical Laboratory for establishing a low-temperature scale and measurements have recently been made over the temperature range from 10° to 90° K.

On the use of the vapour pressure thermometer in the liquid He^4 region. M. DURIEUX and H. VAN DIJK. *Kamerlingh Onnes Laboratory, Leiden (Netherlands).*

The use of a vapour pressure thermometer is advisable in special cases, when highest accuracy is required. In research on the temperature scale for the liquid He^4 region the AA used several vapour pressure thermometers.

Ionic thermometer for liquid helium. I. FASOLI, F. GAETA and F. SCARAMUZZI. *Istituto di Fisica, University of Padua* and *Istituto Nazionale di Fisica Nucleare, Padua (Italy).*

The performance of a diode with an emitting layer of polonium on one electrode shows the possibility of using the anode current as a temperature indicator.

A magnetic method of temperature measurement between 4° and 14° K. M. J. M. LEASK and W. P. WOLF. *Clarendon Laboratory, Oxford (United-Kingdom).*

The method is the result of further work on an apparatus designed by McKim and Wolf (*J. Sci. Ins.*, **34**, 64, 1957) for the measurement of magnetic susceptibilities in the liquid helium and hydrogen temperature ranges.

Constant temperature liquid helium bath and reproductibility of resistance thermometers. H. H. PLUMB. *National Bureau of Standards, Washington (U.S.A.).*

The method of obtaining an extremely constant temperature liquid helium bath at the National Bureau of Standards is herein described. The results of utilizing this bath in determining the reproductibility of resistance thermometers is discussed by the AA.

Other problems of application of very low temperatures in industry

Pipe-line for liquid hydrogen. A. LACAZE and L. WEIL. *Grenoble (France).*

The AA. describe a pine-line for hydrogen, insulated by vacuum, which is protected by liquid nitrogen passing through a screen. The equipment can be quickly assembled and mounted.

Flow of gases through packed powder beds at low pressures. G. MAIDANIK and A. G. MONROE. *British Oxygen Research and Development Ltd., London (United-Kingdom).*

The relationship between the permeability of a powdered bed, which can also be expressed as its specific conductance, and the gas pressure is linear when the gas flow rate is in the region of low values.

Modern evaporation system under pressure of liquid oxygen for industrial use. F. RIVOIRA. *Turin (Italy).*

The separation of methane from coal mine gas. T. SATO. *Nippon Rika Kogyo Co., Ltd., Tokyo (Japan).*

In order to avoid explosions in coal mines, the dangerous methane-air mixture gas must be always eliminated from them. This gas contains 50 to 60 per cent. methane, 40 to 50 per cent. air and 2 per cent. carbon dioxide.

Peltier-cooling at low temperatures by means of semiconductors. H. VOIGT. *Berlin (Germany).*

The applicability of the Peltier effect on semiconductors is investigated for cooling at low temperatures. The necessary effective thermoelectric powers to reach sufficient temperature drops from baths of liquid nitrogen, hydrogen or helium are calculated.

Application of low temperatures to nuclear physics

Some experimental methods in nuclear orientation. E. AMBLER. *National Bureau of Standards, Washington (U.S.A.)*

The paper is divided into two parts : The first part deals with the construction and performance of some scintillation counters used at very low temperatures ; the second part deals with the construction of a He^3 apparatus, designed to allow experiments of fairly wide range to be carried out.

A liquid helium bubble chamber for high energy physics. E. DI CAPUA., U. DORE, G. C. GIALANELLO, P. GUIDONI and G. C. MONETI. *Istituto di Fisica, University of Roma, Istituto Nazionale di Fisica Nucleare, Roma (Italy).*

A 3·7 litre liquid Helium bubble chamber for high energy physics experiments is described. The chamber is to be used in a 16 K Gauss magnetic field and is designed for a repetition time of 1 s. The cryogenic problems of the construction are discussed.

Liquid hydrogen cell of the pile EL 3 of Saclay. B. JACROT, A. LACAZE and L. WEIL. *Grenoble (France).*

Description and results in connection with the liquid hydrogen cell, for obtaining slow neutrons, in the EL3.

Nuclear alignment in some antiferromagnetic salts. A. R. MIEDEMA, H. POSTMA and W. J. HUISKAMP. *Kamerlingh Onnes Laboratory, Leiden (Netherlands).*

Experiments are reported in which radioactive crystals were indirectly cooled by means of heat-conduction to an adiabatically demagnetized cooling agent. The maximum possible

heat flow out of a crystal at very low temperatures can be theoretically estimated to be of the order of 10^6T^4 erg/s cm².

A new helium cooled hydrogen target. G. C. MONETI and V. MONTELATICI. *Istituto Nazionale di Fisica Nucleare, Frascati (Italy).*

The AA. briefly describe a liquid hydrogen-deuterium target for experiments with the Italian 1 BeV electron synchrotron. The refrigeration of the target is obtained by heat exchange with cold helium vapours coming from a commercial liquid helium container, with the advantage of a very safe use of the target.

Physical properties of metals at low temperatures

Electrical and thermal conductivity of nickel in a magnetic field at low temperatures. L. BERGER. *Universite de Lausanne (Switzerland).*

The electrical and thermal conductivities of nickel have been measured at 80° K and at 4,15° K, in transversal fields up to 2,2 Cs/m² ; and in longitudinal fields up to 0,18 Vs/m².

Magnetic structure of evaporated iron films. L. DE GREVE, R. COUSSEMENT and L. SPRENGERS. *Instituut voor Lage Temperaturen en Technische Fysica, Louvain (Belgium).*

The magnetic structure of evaporated iron films, thickness from about 500 to 1·500 Å, has been investigated by means of the optical Kerr effect method.

Thermal conductivity of sintered metal powder specimens at low temperatures. F. X. EDER. *Berlin (Germany).*

Measurements of the thermal conductivity of sintered powder samples of copper and iron at temperatures between 14 and 300° K are reported. The dependence of thermal resistance on grain size, sinter pressure and porosity has been studied.

Current sensitivity of magnetoresistance in ferromagnetic films. A. HIRSCH. *Israel Institute of Technologie, Haifa (Israel).*

Magnetoresistance measurements of nickel films electrolytically deposed and iron films evaporated in high vacuum have been carried out with different measuring currents.

The magneto-resistance of dilute Au-Mo and analogous alloys. B. KNOOK. *Kamerling Onnes Laboratory, Leiden (Netherlands).*

Measurements at low temperatures on the magneto-resistance of dilute alloys of transition metals in a noble metal are reported. In particular the behaviour of gold with small amounts of molybdenium is discussed.

Electrical resistivity of some Gu, Ag, Au and Fe alloys. J. O. LINDE, N. BÄCKLUND and S. HUMBLE. *Stockholm (Sweden).*

The electrical resistivity of some alloys with Cu, Ag, Au or Fe as basic metal and containing different other elements as solutes has been measured in the low temperature and middle high temperature range. The iron alloys have Al, Si, Ni or Mn as solute (concentration range 0·5-3 atomic per cent.).

The specific heat of silver cadmium alloys at liquid helium temperatures. H. MONTGOMERY and G. P. PELLS. *Metallurgy Division, A.E.R.E., Harwell (United-Kingdom).*

Measurements of electronic specific heat are presented for pure silver and for alloys with cadmium up to 30 at. per cent. The results at low cadmium concentration lie close to the free electron values : this is in marked contrast to the behaviour of copper zinc alloys.

A superconducting heat switch for rotational demagnetisation. J. L. OLSEN and P. WYDER. *Institut für Kalorische Apparate und Kältetechnik der Eidg. Techn. Hochschule, Zurich (Switzerland).*

By a suitable arrangement of magnetic screening the thermal resistance of a superconducting wire can be made dependent on the field direction. Such a rotatory heat switch has been investigated.

Low temperature dependence of the electrica resistivity and thermoelectric power of palladium and palladium-nickel alloys containing absorbed hydrogen. A. I. SCHINDLER, R. J. SMITH and E. W. KAMMER. *U. S. Naval Research Laboratory, Washington (U.S.A.).*

Electrical resistivity and thermoelectric power measurements have been made on palladium and several palladium rich, nickel palladium alloys charged with hydrogen. The variation in the electrical resistivity of pure palladium hydrogen with temperature contains a maximum occurring at approximately 45° K and a minimum occurring at approximately 90° K.

Measurements on field dependency of the electrical resistance in thin ferromagnetic films at very low temperatures. A. VAN ITTERBEEK, A. DUPRE and P. GEPTS. *Instituut voor Lage Temperaturen en Technische Fysica, Louvain (Belgium).*

The field dependency of the electrical resistance of thin films of iron, nickel and cobalt has been measured at liquid helium temperatures. The layers were prepared by evaporation on a glass support in a vacuum of 10^{-6} mm of mercury.

Miscellaneous

Velocity of sound at different temperatures in H^2, N_2, air, O_2 and CO_2. V. HOVI. *University of Turku (Finland).*

An apparatus for accurate measurements of the velocity of sound in real gases has been constructed. This apparatus was calibrated by using as a standard gas dried air under known conditions.

Cooperative molecular rotation in solid hydrogen and the Kirkwood-Opechowski method of moments. W. J. TAYLOR. *Colombus (U.S.A.).*

Heat exchange in nitrogen and hydrogen boiling under pressure. P. ROUBEAU. *High-Energy Particle Division, C.E.N., Saclay (France).*

The heat transfer between an horizontal wall and boiling nitrogen or hydrogen has been studied from the atmospheric pressure to the 2/3 of the critical pressure.

A low temperature heat pump. W. E. GIFFORD and H. O. MCMAHON, *Arthur D. Little Inc., Cambridge, Mass. (U.S.A.).*

A new thermodynamic cycle is described for removing heat at very low temperatures (15° K to 150° K) and rejecting it at room temperature. The cycle involves expansion and compression of helium gas in the pressure range of 50 to 300 lb/in².

A new expansion engine refrigeration process. H. O. MCMAHON and W. E. GIFFORD. *Arthur D. Little Inc., Cambridge, Mass. (U.S.A.).*

A new refrigeration process is described which is capable of efficiently supplying refrigeration at temperatures as low as 15° K. The new cycle consists of a combination of an adiabatic expansion engine, which delivers work to the exterior, with small efficient thermal regenerators.

Liquid hydrogen transfer pipes and level regulation systems. M. MARQUET, P. PRUGNE and P. ROUBEAU. *High-Energy Particle Division, C.E.N., Saclay (France).*

This is a description of transfer-pipes and level regulating systems.

Temperature setting and thermal regulation system for liquid hydrogen bubble chamber. J. MEYER, P. PRUGNE and P. ROUBEAU. *High-Energy Particle Division, C.E.N., Saclay (France).*

Hydrogen bubble chamber cooling and constant temperature maintenance in the 25/28° K range by means of liquid hydrogen boiling under atmosphere pressure (20,4° K) need a device, if possible automatic, allowing to introduce a variable amount if cold to counterbalance the heat transfer either static or due to the chamber operation.

Liquid hydrogen and deuterium target. M. MARQUET, P. PRUGNE and M. BOUGON. *High-Energy Particle Division, C.E.N., Saclay (France).*

Description of :

(1) Atmospheric pressure target : liquid hydrogen, 400 mm thickness. Thermal insulation is given by styrofoam. The hydrogen vapours are used to improve the target cooling. Mylar windows.

(2) Vacuum target : 12 litre content : hydrogen or deuterium. Liquid thickness 400 mm. Thermal insulation is given by a vacuum vessel and a liquid nitrogen shielding.

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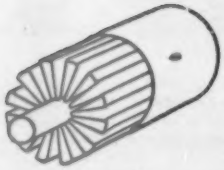

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HEATING AND COOLING

Electronic specific heat of α- and β-brasses at low temperatures. V. HOVI and K. MANSIKKA. *Turka (Finland).*
Electronic specific heats of α and β-brasses have been investigated as functions of composition by applying Sommerfeld's theory and making an assumption concerning free electrons.

Ultrasonic investigation of the elastic constants of solid carbon dioxide. V. HOVI and E. MANTYSALO. *Turku (Finland).*
An ultrasonic apparatus for measurements of the elastic constants of solids has been constructed. By using this apparatus the elastic constants of solid carbon dioxide have been measured at the sublimation temperature of—78·5° C and at frequencies of about 2 Mc.

The specific heat C_v of liquid helium near the λ-point and at various densities. E. KOJO and O. V. LOUNASMAA. *Wihuri Physical Laboratory University of Turku (Finland).*
The specific heat C_v of liquid helium has been measured from 1·5° to 2·8° K and at various densities between the liquid-solid and liquid-vapour equilibrium lines.

COMMISSION V.

COLD STORES AND ICE-MAKING PLANTS

COLD STORAGE PRACTICE GUIDE

Design problems

Influence of kinds of soils and ground-water conditions on the soil freezing progress and frost heaving. R. PIETKOWSKI. *Polytechnic University, Warsaw (Poland).*
The A. introduced some modifications into Ruckli's equation for a case of freezing where capillary ground-water rising occurs, and deduces a general equation for computation of freezing progress in soils at a constant external freezing temperature. The computations accomplished by means of this equation also allow the easy determination of the size of expected frost-heaving.

An example of ground freezing under the rooms of a cold store. J. REMY. *SETIF, Paris (France).*
The A. first describes the process of construction and insulation used. He explains the troubles observed.

Temperature variations under cold stores during cooling down. A. STRADELLI. *Studio Tecnico Industriale, Torino (Italy).*
Discussion of preceding investigations. Conditions of ground-freezing. Heat flow from lower layers.

Temperature variation under cold-stores in operation. A. STRADELLI. *Studio Tecnico Industriale, Torino (Italy).*
Some earlier investigations are discussed and compared with experimental results by rheo-electrical analogs.

Heat amount transferred from the ground to the floor of cold-stores. A. STRADELLI. *Studio Tecnico Industriale, Torino (Italy).*
Calculations based on temperature charts. Means of preventing ground freezing under cold-stores. General efficiency of thermal insulating materials.

Precautions against ground freezing in the construction of cold-stores. J. PAU and G. SAINT-GIRONS. *Compagnie des Entrepots et Gares Frigorifiques, Paris (France).*
The study of some concrete cases met in several cold-stores result in the following conclusions :
(1) Freezing processes appear only in some soils and obviously in presence of water. When these conditions are combined and when it is not possible to divert see pins water from the proximity of cold-rooms, it is necessary to avoid temperatures below 0° C in the basement.
(2) This result can be obtained only by means of an input of outside heat.

Jacket system

The jacket system for cold rooms. C. P. LENTZ. *National Research Council, Ottawa (Canada).*
The jacket system has many advantages over the conventional method of cold room construction ; it provides ideal conditions for the storage of frozen foods, it offers one of the few practical solutions for the problem of insulation deterioration due to moisture condensation, and it allows greater flexibility in evaporator design.

Some heat transfer measurements in jacketed stores. P. NOORDZIJ. *Wageningen (Netherlands).*
The use of jacketed stores for temperatures above 0° C still presents some difficulties compared to those intended for temperatures below 0° C. For this reason the problems of heat transfer have been studied for this type of cold room. The average apparent coefficient of heat transfer of the jacketed store ranged between 4·5 kcal/m²h°C.

The design and operation of the air jacket of the N° 12 Moscow cold store. V. J. KOKOREV. *Ministry of Trade of the R.S.F.S.R., Moscow (U.S.S.R.).*
Fresh fruits and eggs should be stored under conditions which eliminate losses of moisture and in strict observance of the required temperature and humidity. A considerable amount of frozen quarters and halves are in long term storage without any vapour-proof packaging. This also requires such storage conditions that eliminate weight losses.

Use of the jacketed room system for fresh fruit and vegetable storage. C. P. LENTZ. *National Research Council, Ottawa (Canada).*
Most of the advantages of the jacket system over conventional method of construction are even more important in the storage of fresh fruits and vegetables than in the storage of frozen produce. Laboratory tests and "pilot" scale (2000-3000 cubic feet) storage tests with celery and apples have been made.

Some refrigerating systems for cold stores

The investigation of cold stores new cooling systems. S. G. CHUKLIN, D. G. NIKULSHINA and V. P. CHEPURNENKO. *Odessa Technological Institute of the Food and Refrigerating Industry, Odessa (U.S.S.R.).*
The paper discusses a new system, suggested and investigated by the AA., of "longitudinal coil panel cooling" allowing the equipping of the cold storage rooms with jackets without changing the construction and to considerably reduce the temperature difference between the room air and the refrigerant.

Ceiling type blower coils for modern refrigeration applications. D. D. WILE. *Recold Corporation, Los Angeles (U.S.A.)*
In warehouse and other industrial refrigeration applications, ceiling mounted blower units using propeller fans are relatively modern as compared to floor units and other type evaporators. Each year their acceptance has become more widespread until now they are found in almost every conceivable type of refrigeration application.

An attempt to create a new ammonia refrigerating system for a multi-storey refrigerated warehouse. A. TCHORZEWSKI. *Sopot (Poland).*
A simple refrigerating system with central surge tank situated on the roof of a refrigerated warehouse is discussed. Although somehow obsolete this system is still used. The inefficiency of manual control, resulting in flooding of the suction lines from evaporators, is discussed.

The two-storied cold stores with ammonia direct evaporation. E. GROSCHNER. *Forschungsinstitut fur die Kuhl- und Gefrierwirtschaft, Magdeburg (Germany).*
The cooling chambers within the basement are for temperature ranges between ± 0° and — 2° C. Those at the ground floor serve several purposes within the range of ± 0° C. up to — 20°C. The expensive sub-freezing protection is made profitable by using refrigerating chambers at basement level.

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Connection of cooling batteries for rooms of about 0° C, in order to secure better air conditions. L. GANGS. *Budapest (Hungary).*

With conventional cooling batteries, relative humidity needed can be reached only when the goods have been cooled, i.e. during storage. If the cooling demand is larger, relative humidity will drop during cooling, so that loss of weight is inevitable. Loss of weight can, of course, be reduced if vapour is injected into the storage room.

Electric regulating devices of cold stores with semi-automatic operation, with central panels for remote control and indicator light boards for refrigerating circuits. G. SAINT-GIRONS and A. PATIN. *Compagnie des Entrepots et Gares Frigorifiques, Paris (France).*

In place of full automatic operation, it is better in some cases to substitute a semi-automatic equipment designed to facilitate as much as possible the work of operating staff and to secure maximum safety, by preventing any errors.

(publication of these abstracts will be concluded in our October issue)

New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

Hydraulic Cooling Tower Co. Ltd., Copthall House, Copthall Avenue, E.C.2. To acquire and develop patents for the construction of hydraulic cooling towers, and to carry on business of civil consulting and manufacturers engineers, etc. Nominal Capital : £100. Directors not named. Subscribers : Anthony J. Sumption and David E. B. Besant, 52 Mark Lane, E.C.3. Registered by Malkin, Cullis and Sumption, E.C.3.

Lane Wishard & Co. Ltd., 253 Birchfield Road, Perry Barr, Birmingham, 20. Secretary : Joan E. M. Richardson. To carry on the business of heating, ventilating and refrigeration and air-conditioning engineers, etc. Nominal Capital : £5,000. Directors : Leopold P. Lane, 253 Birchfield Road, Birmingham, 20 ; Mrs. Joan E. M. Richardson, 251 Birchfield Road, Birmingham, 20 Solicitors. D. G. Barnett & Co. Birmingham. Registered by Solicitors' Law Stationery Society Ltd.

Taylor Appliances (Wholesale) Ltd., 15, Cornwall Place, Marton, Blackpool. Secretary : Gerald H. Fitzpatrick. To carry on business of manufacturers of and dealers in refrigerators, cabinets, coldrooms, etc. Nominal Capital : £5,000. Directors : Michael A. Toomey, O.B.E., 67, Colne Road., Burnley ; Gerald H. Fitzpatrick, 46, Buchanan Street, Blackpool ; Albert J. Day and John H. P. Dalton. Solicitors : Nye and Donne, Brighton. Registered by Jordan & Sons, Ltd.

R. J. E. Platt (Electrical) Ltd., West Street, Marlow, Bucks. To carry on business of factors of, agents for and dealers in wireless and television apparatus, washing machines, refrigerators, etc. Nominal Capital : £1,000. Directors : Reginald J. E. Platt and Doroth B. Platt, Bolebec, Medmenham, Bucks. Registered by Witherby & Co. Ltd.

Woodcock Bros. Ltd., 2, Tranter Avenue, Alvechurch. Secretary : B. J. Woodcock. To carry on business of electrical, mechanical, chemical, heating and ventilating refrigerating, radio and telegraph engineers, etc. Nominal Capital : £500. Directors : Brian J. Woodcock, 2, Tranter Avenue, Alvechurch; Barry M. Woodcock, 2, Beach Farm Croft, Birmingham, 31. Registered by R. E. Southall, Rednall.

Mackay Insulations Ltd., 13, Camp St., Salford, 7. Secretary: K. Cockshott. To carry on business of specialists in thermal insulation, etc. Nominal Capital : £2,000 Directors : John V. Cockshott, 278, Tatton Street, Salford, 5 ; George C. Cockshott, 13, Camp Street, Salford, 7 ; Kenneth Cockshott, 48, Burnage Lane, Manchester, 19. Registered by Shaw & Blake, Ltd.

Alfred Porter (Service) Ltd., Stella Wprks, Stanley Road, Teddington. Secretary : G. F. Crook. To carry on business of repairers, manufacturers and assemblers of refrigeration and ice cream machinery, etc. Nominal Capital : £2,000 in £1 shares (500 "A" ordinary and 1,500 "B" ordinary). Directors : George F. Crook, 293, Princes Road, Dartford ; Hubert T. Jacobs, 70, Eastern Avenue East, Romford. Registered by Cansdale & Co., E.C.2.

R. J. Sweeting-White & Co., Ltd., 6, Gate Street, W.C.2. Secretary : Eva L. Gaskin. To carry on the business of electrical heating, ventilating and air-conditioning engineers, etc. Nominal Capital : £1,000 in £1 shares. Directors : Raymond J. Sweeting-White, 1, Friar Road, Hayes, Middlesex ; Robert W. W. Hammond, Greenacre, Jordans Way, Jordans, Bucks. Registered by Stanley, Dean & Co., Ltd.

Refrigeration C.M.C. (Distributors) Ltd., 8, High Street, Sidcup. To carry on business of inventors, advertisers, designers, manufacturers of and dealers in refrigerators, etc. Nominal Capital : £100 in £1 shares. Directors : Catherine M. Coghlan Gabb and Leonard C. Coghlan Gabb, 13a, Therapia Road, S.E.22. Registered by Solicitors' Law Stationery Society, Ltd.

Rochdale Oil Heating Co. Ltd., 29, Maclure Avenue, Rochdale. Secretary : Veronica Scotson. To carry on business of heating, ventilating and air-conditioning engineers, etc. Nominal Capital : £2,000 in £1 shares. Directors : Jack Scotson and Veronica Scotson, 4, Turn Hill Road, Rochdale. Registered by Hutton Hartley & Co. Ltd.

J. & E. Hall (Engineers) Ltd. To take over the business of manufacturers of refrigerating and air-conditioning equipment, lifts and escalators carried on at Dartford and elsewhere by J. & E. Hall Ltd. Nominal Capital : £100 in £1 shares. Directors : to be appointed by the subscribers. Subscribers : J. D. Farmer, Bambi Cottage, Parkfields, Sevenoaks ; A. Greenfield, "Martiques," 17 High Road, Wilmington, Kent. Registered by solicitors, Allen & Overy, 3, Finch Lane, E.C.3.

Harford Pumps Ltd., 3, Oxford Street, W.1. To carry on the business of heating, ventilating and air conditioning engineers etc. Nominal Capital : £10,000 in £1 shares. Directors : Lt.-Comdr. J. A. Langford-Holt, M.P., 44 Queens Grove, N.W.8; John R. Berend, 3, Ingram Avenue, N.W.11 ; Henry E. Hassett & Karl H. Rothenberg. Registered by Stanley, Dean & Co. Ltd. Secretary : R. C. Allen.

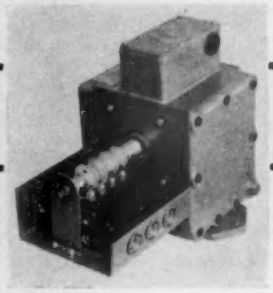
Colvin-Smith (Air-Conditioning) Ltd., 123-5, Clayton Street, Newcastle upon Tyne, 1, Secretary : Daphne A. Colvin-Smith. Nominal Capital : £1,000 in £1 shares. Directors : Peter M. Colvin-Smith and Daphne A. Colvin-Smith, Roughside, Eastern Way, Ponteland. Registered by Chas. Davy & Co., Ltd.

Oil Heating (North West) Ltd., 17, Elbow Lane, Formby Lancs. Secretary : D. H. Brabner. To carry on business of heating and air-conditioning engineers, etc. Nominal Capital : £100 in £1 shares. Directors : Arthur Briscoe, The Homelet, Freshfield Road, Formby ; Herbert L. Swift, Dogan Dusti, Jos, Northern Nigeria ; Wm. Wilkinson & Denis H. Brabner. Solicitor : D. H. Brabner, Liverpool. Registered by H. T. Woodrow & Co., Ltd.

Leeds Asbestos Insulations Ltd., 14, Woodsley Road, Leeds, 3. Secretary : J. B. Mitchell. Nominal Capital : £5,000 in £1 shares. Directors : Leslie S. T. Hilliard and Mrs. Vera Hilliard, 14, Woodsley Road, Leeds, 3. Registered by Shaw & Sons, Ltd.

Sarum Refrigeration Services Ltd., 30 Milford Street, Salisbury, Wilts. Secretary : Angelo F. Rigiani. Nominal Capital : £2,000 in £1 shares. Permanent Directors : Angelo F. Rigiani and David G. Rigiani, 7 Wain-alon-Road, Salisbury. Registered by Jordan & Sons, Ltd.

Commercial and Industrial Section



MANUFACTURERS' AND DISTRIBUTORS' NEWS

G. Williams Engineering Co. Ltd., whose contact plate freezers are well known in quick-freezing circles, have announced that they are now offering these units with a revolutionary new freezing plate. Freezing times of three hours and one hour are claimed for 4-in.-thick and 2-in.-thick blocks whole fish, respectively, and this represents an improvement of almost 100 per cent on freezing times obtained with conventional plates in current use. These new plates have also been tested on ice cream hardening duty when one pint cartons of ice cream were hardened to a temperature in the centre of –5° F. in 30 minutes. The new plate differs from ordinary plates inasmuch as nearly all of the plate surface is in contact with the refrigerant passing through the plate and can be regarded, for all practical purposes, as having 100 per cent prime surface. A much higher rate of heat transfer is obtained due to the effectiveness of the entire plate surface and also due to the internal construction which permits the provision of a progressively increasing flow area as the refrigerant absorbs heat and increases in volume during its passage through the plate. The greatly improved efficiency is reflected in the above-mentioned freezing times. Williams have recently transferred their manufacturing facilities to a new modern factory at Thetford, Norfolk, and can offer freezers with the new plates, together with a complete range of compressors, condensers and ancillary equipment, at competitive prices and short deliveries.

* * * *

A further item of interesting news from Williams is the announcement that they are offering a fully automatic system of block ice-making. These automatic ice plants dispense with brine, ice cans and frames, can thawing and filling tanks, cranes and can dumps and they produce and harvest the blocks automatically using the direct evaporation of ammonia refrigerant as the cooling medium. The plants are available in the capacity range 5 to 100 tons per 24 hours producing blocks of 56 to 400 lb weight and advantages of the new system are as follows :—Saving in space—the new system occupies only 25 per cent. of the space required for a conventional brine/can type of plant ; ice production at 30 per cent. less cost per ton than with conventional plant ; Reduced maintenance—there is no brine to cause corrosion and ice cans and frames to maintain and periodically replace ; rapid production of ice from start up—conventional system 14 hours, automatic system 3 hours. Further information on quick-freezing plant incorporating the new freezer plates and an automatic block ice plant will be gladly supplied on request to G. Williams Engineering Co. Ltd., Disraeli Road, Willesden, London, N.W.10, Telephone No. ELGar 4225.

An interesting film describing this ice-making system was recently shown in London to the trade and to the technical press.

* * *

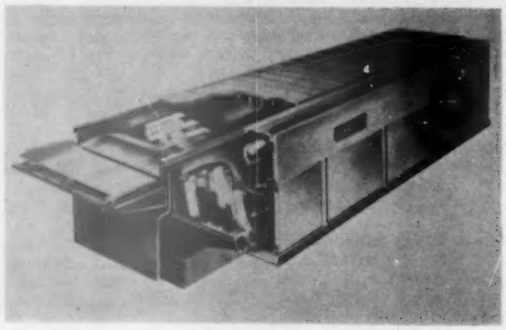
Four mould release agents, well known on the continent under the trade name "Lusin," are now available in England. The manufacturers, **Lange & Seidel**, of Nuernberg, have appointed as sole U.K. agents the London firm Charles H. Windschuegl Ltd., 1, Leadenhall Street, London, E.C.3. The four agents comprise Lusin KE10, a universal mould release agent, KE195 for glass clear mouldings and phenolic resins, KE200 for polyesters, Epoxy resins etc. and KE400 for the separation of reinforced plastics manufactured under conditions of heat and pressure.

* * *

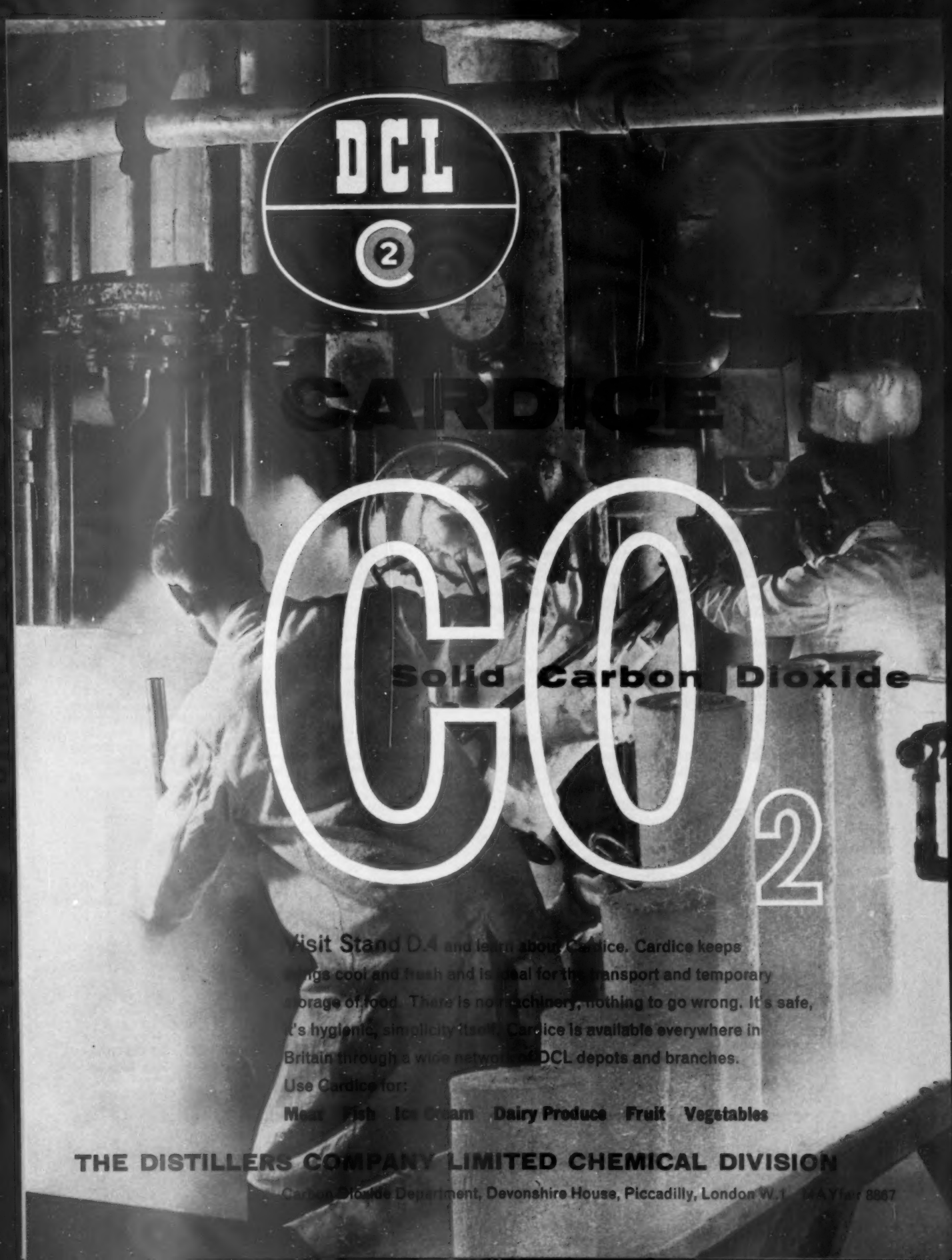
R. H. Cole & Co. Ltd. announce that Mr. Gilbert Dodd of Monsanto Chemicals Limited has been appointed a member of their board of directors.

* * *

A two-stage rotary booster package with interstage liquid and gas cooler, automatic lubrication system, completely piped, insulated and mounted on a common structural steel base, has recently been introduced by **Freezing Equipment Sales**



New Grasso ice-making system.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Inc. of York, Pennsylvania, and will be available for export to this country. Jacket cooling in the rotary is provided by an oil system with a refrigerant controlled cooler. No jacket water is necessary to operate the two-stage system. The package is especially adapted for low temperature storages or freezing tunnels where engine room space is at a premium. Package design may allow installation in processing area and eliminate need for additional building space to house refrigeration equipment. Rotary booster packages are designed for low temperature refrigeration applications, such as frozen food and ice cream storage rooms, large supermarkets and wholesale distributors, frozen food processing, low temperature test chambers. The rotary booster package consists of the following : a low stage FES-Fuller rotary booster model F25 operating at 1,500 r.p.m. Rotary includes suction strainer, suction and discharge stop valves, jacket oil cooling system, suction and discharge pressure controls, discharge temperature limit control, v-belt drive with 20 h.p. 220/440/3/60 a.c. motor. A high stage reciprocating compressor 2⅛ by 2¼—6-cylinder operates at 1,750 r.p.m. Reciprocating compressor includes suction and discharge stop valves, suction strainer, high and low pressure cutouts, oil pressure differential switch, shaft coupling and 20 h.p. 220/440/3/60 a.c. motor, electrical starting equipment and wiring are not included. Model F256 package has the following overall dimensions : Length 6 ft. ; width 3 ft. 3 in. ; height 5 ft. Rating with refrigerant—12 at 105° F. condensing temperature is —30° F. evaporative temperature 12·0 tons ; –50°F. evaporative temperature 6·8 tons ; and—70° F. evaporative temperature 3·6 tons.

* * *

The problem of efficiently insulating a building that has electric under-floor heating, is dealt with in a new leaflet issued by **Expanded Rubber Co. Ltd.** The leaflet gives four reasons for using the company's Onazote as insulating material—its high resistance to water absorption, its thermal conductivity figure of 0·20 B.t.u./sq. ft. hour °F/inch at a mean temperature of 50° F, its good compression strength and the fact that it does not support fungoid or bacterial growth. Three diagrams show different ways in which Onazote may be installed : as edge insulation only on the perimeter walls ; in a horizontal layer—recommended under a large expanse of window, floor to ceiling windows or opening in a wall, and where a porous subsoil is encountered ; and as insulation applied to an existing building where floor heating is to be installed.

* * *

Mr. D. C. M. Salt has been promoted director of sales and Mr. J. M. Kershaw director of development and market research of **Monsanto Chemicals Ltd.** The company has at the same time discontinued its divisional organization and its two divisional development departments have been unified under Dr. J. A. Gardner as controller of development. Mr. Salt, who has been with Monsanto for 24 years, was previously general manager of the chemicals division. Mr. Kershaw joined the company in 1946 and was formerly chief engineer. Dr. Gardner, who was previously in charge of development planning, has served for 22 years with Monsanto. Mr. O. W. Murray, who joined the company in 1932, has been appointed chief engineer in place of Mr. Kershaw.

* * *

A dewpoint meter developed in America and now being manufactured in this country under licence is finding, by virtue of its easy operation and consistent accuracy, applications in a wide range of processes where moisture contents of dry air and other gases must be determined. Typical uses of the meter include checking the dryness of air supplies for refrigeration and air-conditioning and of atmospheres used in heat treatment processes. Other uses have been found in the operation of supersonic wind tunnels, the assembly of high voltage transformer and the making of glass to metal seals. The meter known as the Alnor dewpointer, is portable and self contained, requires no coolant, and has a measuring range from –80° F. to room temperature or from 0·0015 to about 2·75 per cent water vapour by volume. The measurements are made by compressing a sample of the gas to a pressure at which, on suddenly releasing the pressure a mist is formed, the temperature of the dew point then being calculated from the temperature and pressure ratio before expansion. Easy conversion of the sample temperature and pressure ratio to dew point temperature is made with an Alnor dewpoint calculator. The gas to be checked is drawn through the meter into an observation chamber with a hand pump, the chamber being fitted with a purging valve to allow a previous gas sample to be cleared. The chamber is illuminated to make the mist easily visible. The pump is designed to prevent the slightest trace of moisture being introduced into the chamber by the wiping action along its barrel. The meter is fitted with a sensitive thermometer mounted in clear perspex and a pressure ratio gauge to give quick direct readings of the ratio of atmospheric pressure and observation chamber pressure. The meter can be battery operated or connected to the mains. The Alnor dewpointer is being marketed in this country by the **Electric Resistance Furnace Co., Ltd.,** a subsidiary of Efco Ltd.

* * *

With the acquisition of the lease of No. 14 Grosvenor Place, the **Cambridge Instrument Company's** headquarters have been extended. This has permitted enlarged sales facilities and better attention to customers and correspondents. The official address remains 13 Grosvenor Place. The publicity and accounts departments, which in recent months have had separate premises, have moved back to headquarters, and the premises at 60 Buckingham Palace Road have been vacated.

* * *

The Hotpoint Company in the United States has recently developed a new type, 19 c.ft. chest type food freezer which holds 683 lb. of frozen foods at zero temperatures. Features of the new "family freezer" include interior light, gliding wire baskets, and automatic temperature control which adjusts from zero to 10 below zero.

* * *

Developments in storage of liquid oxygen cater for both the small and the large consumer. Plant, labelled LC3, made by **British Oxygen Gases Ltd.,** Spencer House, St. James's Place, London, S.W.1., will hold 2,900 c.ft. of oxygen and will supply gas at the rate of 300 c.ft. per hour at a pressure of 85 lb. per sq. in. It consists of a single cylinder which is vacuum insulated, and incorporates a vaporizing unit so that oxygen

COMMERCIAL AND INDUSTRIAL

is drawn off as gas. The Coval, by the same makers, is designed for outdoor operation to receive liquid oxygen from transport vehicles, and to convert this liquid to gas at a predetermined automatically controlled pressure. Its effective capacity is 125,000 c.ft. of oxygen, and it will supply gas at a steady rate of 30,000 c.ft. per hour at a maximum pressure of 230 lb. per sq. in. In this unit, the liquid is contained in a vertical stainless steel cylinder, mounted inside another cylinder of mild steel. The inner and outer cylinders are separated by insulating blocks, and the annular space between them is filled with a powder insulant and evacuated.

* * *

At the thirty-second annual general meeting of **Chambers Wharf and Cold Stores Ltd.** held in London, Mr. Charles Goldrei, chairman and managing director, presiding, said, in part: "The net profit before taxation for the 52 weeks ended March 27, 1959, after charging depreciation and the other charges detailed in the accounts is £295,029 as against £350,476 for 1957-58. The charge for taxation is £148,955 as against £204,598, thus leaving the net profit after tax at £146,074 as against £145,878 for the previous year. £54,000 has been transferred to general reserve. . . .

"In my statement last year I reported the completion of the extension to our riverside jetty. This has considerably improved our riverside berthing and cargo handling facilities and enabled us to increase the number of ships worked. During the year two of our older warehouses have been demolished and are being replaced by a modern riverside dry goods warehouse of some 3,500 tons capacity, which should be completed by the end of the year. We have acquired the adjoining freehold riverside warehouses, known as Sterling Wharf, which, after alterations, should be available by September next. In order to improve the facilities offered to our customers, especially in the meat and quick frozen food trades; a night service at our riverside cold store has been in operation since May 1, 1959. Your directors decided that the time had arrived to provide additional cold storage accommodation in the suburbs of London and so assist in the distribution of quick frozen foods. We are therefore now erecting a modern mechanized cold store of some 5,000 tons capacity in the Walthamstow area, and this we hope will be in operation before the end of the summer."

NEW E.E. FRIDGE

The English Electric Company Ltd., last month introduced their 1960 table top refrigerator, six

months ahead of the originally scheduled date next March.

The cabinet has overall dimensions of 36 inch standard height and a width of only 20¼ inches by 22½ inches depth, but clever design of shelving and interior fittings gives a 4 cubic feet capacity and a shelf area of 6.8 square feet. In addition, the shelves may be arranged in twenty different "patterns" to allow for all the shapes and sizes of bottles, dishes and jars in normal family use to be stored easily as well as extra bulky items such as hams, large joints or turkeys. Other new features in this English Electric model 7504 are lower temperature storage in an enclosed evaporator and an improved high efficiency motor and compressor giving a reduced power consumption.

The cabinet of the model 7504 is steel, welded construction with a vitreous enamelled table top and other exterior surfaces are finished in rust-proof-treated stoved synthetic enamel. The door handle is of simple design with no moving parts and is made of a chromium-plated die-casting. The food compartment and door liner are all-plastic with built-in shelves, shelf supports and breaker frame.

The large evaporator is totally enclosed and is made of aluminium refrigerated on both sides and bottom. It is finished in durable lacquer with the back and top section anodized to prevent corrosion. A moulded polystyrene door is fitted which is self-closing and drops down to form a rest for items being removed from the evaporator. It is provided with a 16 cube polythene ice-tray and grid over which a plastic coated, steel wire shelf is fitted to increase the space available for frozen packet foods.

A unique degree of flexibility of shelf arrangement has been provided.

BUYERS' GUIDE

Research Progress in Quick-Freezing

By HOWARD FOX

PROGRESS over a wide field of research in quick-frozen foods was revealed at one of the full sessions of this year's conference of the Institute of Food Technologists. Held this time in Philadelphia, more than 135 papers were presented by food research laboratories of the United States and 10 of them related to quick-frozen foods.

The U.S. Department of Agriculture, Human Nutrition Research Division, reported on the ascorbic acid and carotene content of frozen broccoli as influenced by various factors. It was pointed out that significant losses of ascorbic acid occurred during the cooking of the product. Leaching of ascorbic acid into the cooking liquid rather than destruction by heat was found to be chiefly responsible for this loss. Retention of ascorbic acid in frozen broccoli cooked by micro-wave and conventional methods compared favourably with that in fresh broccoli cooked by the same methods. No important losses in the carotene content of broccoli were found.

Frozen broccoli contained less dehydroascorbic acid (5 to 9 mg. per 100 gm.) than did fresh broccoli (6 to 52 mg. per 100 gm.). The loss of this compound during cooking appeared to be directly related to the amount present before cooking. No ascorbase was found in frozen broccoli. However, fresh broccoli contained considerable amounts of this enzyme.

Frozen broccoli obtained directly from the processor and stored for 253 days at 0° F., compared favourably to fresh broccoli in ascorbic acid content. Only slight decreases in reduced ascorbic acid and slight increases in dehydroascorbic acid and diketogulonic acid were detected as the result of the 253-day storage period.

Two research workers at the Department of Food Technology, University of California, reported that the influence of harvest maturity on several chemical constituents of boysenberries had been investigated. Accompanying maturation, there was a decrease in titratable acidity and an increase in soluble solids content. The decrease in acidity was attributed to the decrease in citric and malic acids which were metabolised rapidly during maturation. Malic acid was found to decrease at a faster rate than citric acid. Cisaconitic and isocitric acid were also found in smaller quantity.

The importance of these chemical constituents to flavour and consistency of quick-frozen boysenberry pies was discussed and attention drawn to the fact that a proper control of maturity of individually quick-frozen berries is essential to the quality of the frozen pie.

From a team of technicians at the U.S. Department of Agriculture, Western Utilisation Research and Development Division, came a report on the effect of temperature on storage stability of frozen cakes.

Cakes are known to be well adapted to preservation by freezing, but successful application of the method requires careful appraisal of limitations of all steps in the procedures used. The investigation which formed the subject of the report to the IFT annual conference yielded data on the stability of five kinds of commercial cakes at several sub-freezing temperatures.

Angel food, chiffon, yellow layer, chocolate layer, and pound cakes were stored at 10°, 0°, –10° and –30° F. At intervals, taste panel comparisons were made against freshly baked control cakes to determine the time required for significant differences to occur in the frozen cakes.

The report stressed that even after significant changes had occurred, the quality of the stored cakes was still quite good. They were, in fact, superior to unfrozen cakes held for 24 hours at room temperature after baking.

Texture changes in the stored cakes were generally detected before changes in flavour. Principal texture changes were loss of original crumb resiliency and increases in crumbliness and harshness. The flavour gradually declined, to yield an increasingly bland product.

Yellow and chocolate layer cakes exhibited relatively good stability at 10° F, and greatly improved stability at 0° F. However, little gain in stability was obtained at –10° and –30 F. Angel food and chiffon cakes showed poor to fair stability at 10° F., greatly improved stability at 0° F., and still further improvement at –10° and –30° F. Pound cakes were roughly intermediate in behaviour to the other two pairs of cakes.

From the Western Regional Research Laboratory came a report on the quality changes in frozen spinach stored in retail packages.

Several lots of commercially packed spinach obtained under known processing conditions were subjected to constant and fluctuating storage temperatures in the range –20° to 40° F. The rate of chlorophyll conversion to pheophytin was constant with storage time for constant or symmetrical temperature conditions. It doubled for about every 5° F. increase in effective constant temperature in the range 0° to 25° F. Chlorophyll deterioration was a little more rapid in spinach than in peas but slower than in green beans.

When a judge's average visual colour scores for a series of samples increasing in deterioration were plotted, a similar systematic relationship was apparent.

Decrease in ascorbic acid content and elapsed time for a detectable flavour change also indicated rapid deterioration in quality in the range 10° to 40° F. Package to package variation was a serious problem in ascertaining rates of deterioration. Factors that contributed to variability were non-uniformity of blanch, amount of residual water, number of yellow leaves, and amount of stems. Good packaging was

necessary to prevent undue moisture loss and temperatures as low as 0° F. were necessary to maintain good quality up to eight months of storage.

Among the other papers presented on the subject of quick-frozen food processing at the 1959 IFT conference was one from two technicians at the Poultry Science Department of Purdue University. The study arose from the need to have data about the freezing and thawing rates of poultry meat held under varying conditions.

The department therefore went ahead and collected information on the relative freezing rates of poultry meat frozen in an immersion brine tank, liquid spray freezer system, and conventional air freezers. Thawing rates were obtained for poultry in air at different temperatures, packed in boxes of several constructions and immersed in running cool water. Freezing rates were obtained for packaged whole birds and thawing rates for whole birds and cut-up packaged birds.

The times required for the surface temperature of fryers to rise for 10° to 32° F. when held in boxes placed in a room at 68° F. were as follows :—

Completely aluminium laminated box	27 hours
Aluminium laminated box but plain fibreboard top	15 ,,
Waxed box with plain fibreboard top	15·75 ,,
Polyethylene laminated box	13 ,,

Similar observations were obtained for these boxes held at other room temperatures varying from 35° to 55° F.

Freezing rates of poultry meat in liquid freezers are affected by liquid temperatures, rate of liquid flow and viscosity of the liquid.

How to prevent the darkening of meat near the bone of frozen poultry was the subject of a piece of research work carried out at the Georgia Experiment Station and reported on at the conference.

The darkening of meat in this manner detracts from the appearance of the product and it was established that the kind of feed, methods of bleeding, rate of chilling, and time of freezing storage had little or no influence on the matter. However, meat discoloration was prevented by heating the chicken parts to an internal temperature of 180° F. before freezing. This was accomplished, in order of preference, by heating with micro-waves, live steam, deep fat at 350° F., radiant heat oven at 350° F., or steam pressure.

Heating with micro-waves was highly effective, required three minutes, and resulted in 19·6 per cent. moisture loss. Heating with live steam was also effective, required 26 minutes and resulted in 17·4 per cent. moisture loss. The other methods were slightly less desirable.

A new ice for the preservation of poultry and other foods has been prepared by a team of research workers at Louisiana State University and was the subject of a paper presented at the I.F.T. conference.

The ice contains 100 to 500 p.p.m. of glycol diformate, an equal amount of sorbic acid, and some 25 ml. of hydrochloric acid per ton of water. The acid is added to the solution of the two ingredients just before the water begins to freeze in the flake-ice-making machine. The above cited chemicals are more efficient for preservation when used in the form of flake ice because, in this case, the active form of preservatives act in a *status nascendi*, but can also be used in the form of solution for dipping purposes.

Experiments were conducted on poultry, meat, shrimp, oysters, fruit and vegetables. In every case the beneficial effect of the new ice, in comparison with the common ice and the antibiotic dip was definitely demonstrated. In the case of chicken, for instance, the final score of five experiments and of five different quality tests (bacterial count, organoleptic test, and three chemical tests) showed the following results (the rating values run high when the quality runs low) :—

Controlled chickens (stored in common ice)	26
Chickens dipped in antibiotic and stored in common ice	23
Chicken stored in the new ice	11
Fresh chickens	8

Important work on the freezing of starch and starch derivative systems was reported by a team of workers at the Department of Food Technology, University of Illinois.

Further findings from this conference are reported upon in the September issue of our sister journal FROZEN FOODS, *obtainable from Maclaren House, London, S.E.1.*

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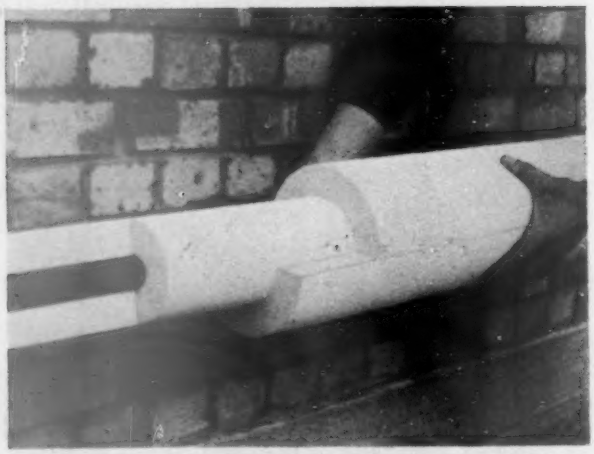

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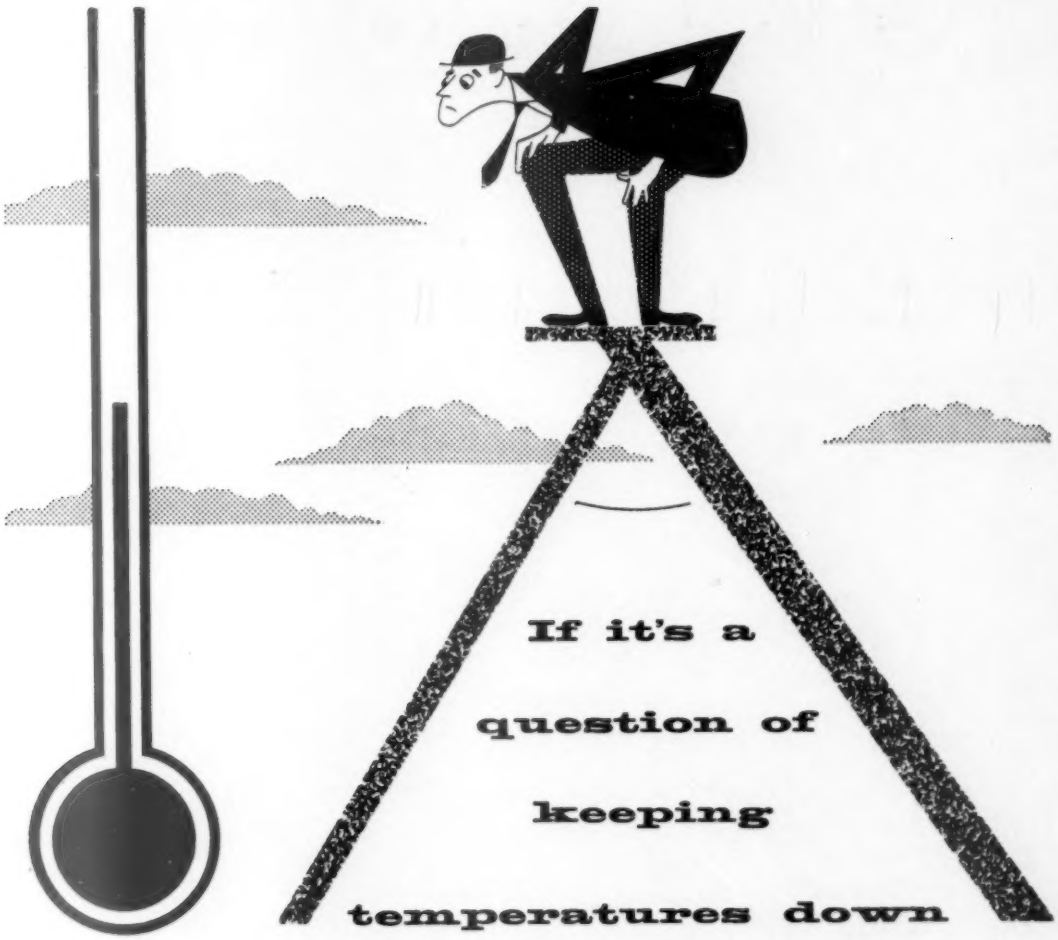

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